

THE PRACTITIONER'S HANDBOOKS
THE RHEUMATIC DISEASES
By J. ODERY SYMES, M.D. (Lond) D.P.H, M.R.C.S, L.R.C.P.



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PRACTITIONER'S HANDBOOKS—I.

EDITED BY HARRY ROBERTS

THE RHEUMATIC DISEASES

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THE RHEUMATIC DISEASES

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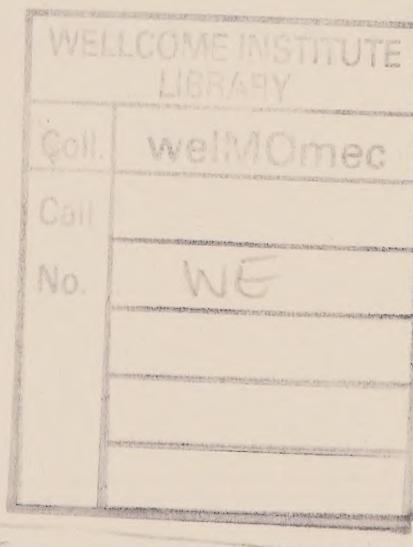
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THE RHEUMATIC DISEASES

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INTRODUCTION

THE term "Rheumatism" has been generally applied to a variety of conditions associated with pain in the joints, muscles, nerves, and fibrous tissues of the body. As our knowledge of these conditions has progressed there has been an increasing tendency to limit the use of the word in this way, and to employ the words "rheumatism" and "rheumatic" only for such conditions as are excited by a specific micro-organism, the *diplococcus rheumaticus*. Used in this way the term "rheumatic diseases" would include the various manifestations of acute, chronic, and muscular rheumatism in adults and children, and certain cases of acute and chronic rheumatoid arthritis, the exciting cause of which is in our opinion a modified or avirulent form of the *coccus* of acute rheumatism.

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The condition of arthritis, and general constitutional disturbance which may follow or complicate many acute infective processes, such as scarlet fever, gonorrhœa, dysentery, malaria, smallpox, pneumonia, and sepsis is generally spoken of as a rheumatism, and the term is a convenient one, as it emphasises the fact that the arthritis is only a part of the disease.

With regard to many of these forms of enthetic arthritis we are now able to state that they are caused by the action of a specific organism or its toxin upon the joint tissues. In the case of others, such as scarlatinal and gonorrhœal arthritis, medical opinion is divided, there being some who believe that these arthrites are but modified forms of acute rheumatism. Until our knowledge of the bacteriology of these conditions is extended, and until our methods of detecting the specific organism of acute rheumatism are further developed, we cannot hope for a satisfactory classification of rheumatic diseases.

For these reasons we have included gonorrhœal and scarlatinal arthritis under the head of rheumatic diseases, whilst at the same time expressing our opinion of their true nature.

INTRODUCTION

In the present state of our knowledge of the many forms of arthritis, it would be inadvisable to adopt any new classification, and for this reason we have confined ourselves in the present work to such conditions as are generally spoken of by the medical profession as "rheumatic diseases."

I have to thank Dr. Preston King of Bath, and my colleagues at the Bristol General Hospital, Drs. Michell Clarke and Newman Neild, for many of the photographs illustrating the text.

I

ACUTE RHEUMATISM

Definition.—A specific acute infective fever characterised by sweats, shifting inflammatory changes in the joints and related structures, in the heart and in the serous membranes.

PREDISPOSING CAUSES.

Age.—Rheumatic fever is essentially a disease of childhood and young adult life. In children under one year of age, however, the disease is extremely rare, and after the age of fifty first attacks are uncommon. In a series of one hundred and ninety-three cases admitted to the Bristol General Hospital the age periods were as follows:—

0-10 years, 16 cases =	8.3	per cent.
10-20 years, 61 cases =	31.5	„
20-30 years, 47 cases =	24.3	„
30-40 years, 45 cases =	23.3	„
40-50 years, 18 cases =	9.3	„
50-70 years, 6 cases =	3.1	„

These figures do not properly represent the

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incidence of the disease in children, as only a limited number of beds are available for children, and only such cases as exhibited marked articular or cardiac signs would be classed under the head of rheumatic fever.

Sex.—Amongst adults males are much more subject than females to acute rheumatism. My own statistics show the disease to be almost twice as frequent in men. It has been thought that the heavier incidence upon men is due to the more exposed nature of their work, but the fact that rheumatic fever is most prevalent in the warm weather of summer and early autumn would seem to negative this view. The severe mechanical strain of the work performed by many of the working-class may render the joints peculiarly susceptible to attack, and the greater part of such manual labour falls upon the men. At one period of life—viz. from 10 to 15 years of age, females are much more susceptible to the rheumatic virus than are males. At all other periods, however, the males predominate.

Heredity.—It is constantly seen that the children of persons who have suffered from rheumatic fever, or other rheumatic manifestations, are peculiarly liable to the disease.

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This is the more marked if both parents share the taint, and especially if there be consanguinity. There is some evidence to show that foetal rheumatism is sometimes responsible for endocardial lesions found at birth. It is not so easy to establish a family history of rheumatic fever in the case of first attacks occurring in adults, but most physicians will recognise that in many families there is an arthritic diathesis, and that this is transmitted, appearing in one generation as acute or chronic rheumatism, in another as rheumatoid arthritis, and in another as gout. When inquiring into the family history of a case, the patient should be questioned as to the occurrence of chorea, tonsillitis, erythema nodosum, and other manifestations of rheumatism which are not generally recognised as such by the public.

Race, Climate, and Soil.—Although acute rheumatism may occur in any variety of climate and soil, it is most prevalent in sub-tropical and temperate climes, and least so in the tropics. The coloured races are less subject than the white. The incidence of rheumatic fever is high in countries which present wide variations of temperature in the course of twenty-four hours, *e.g.* Egypt and

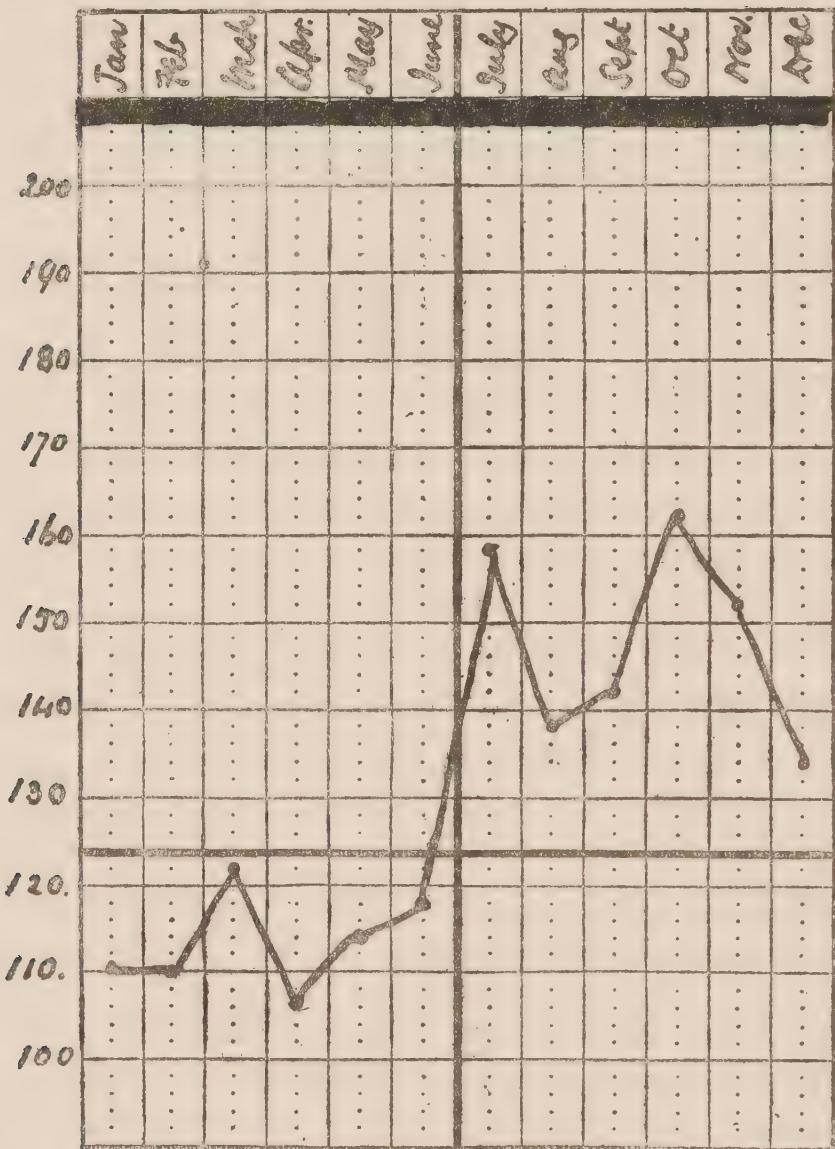
ACUTE RHEUMATISM

Cape Colony ; and Newsholme has sought to prove that the incidence of the disease is greatest when the level of the subsoil water is low and the earth-temperature is high. Other observers maintain that cold, damp, low-lying localities, and dry, hilly, bleak sites, are those most favourable to the production of acute rheumatism. In England the incidence of the disease is higher in the urban than in the rural districts, and on the west coast than on the east. That cold plays but a small part in the production of acute rheumatism is demonstrated by the fact that Scotland suffers less than England.

Influence of Seasons.—The common belief that rheumatism is more prevalent in the colder and wetter months is probably due to the fact that the pains of chronic rheumatism and rheumatoid arthritis are more troublesome at these periods. Rheumatic fever in England is least common during the first six months of the year ; there is a sudden increase in the number of cases in July, and the maximum is reached in September, October, and November. The accompanying chart, prepared from a series of cases admitted to the Bristol General Hospital during the years 1893 to 1902, shows that

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the curve obtained here very closely re-



The average monthly rainfall in Bristol from January to June does not exceed 2.5 in., and from July to December does not fall below 3 in.

semblies the curves which have been published for London and other parts of the country.

ACUTE RHEUMATISM

Previous Illness.—Acute articular rheumatism is especially liable to occur in those who during infancy or childhood have suffered from one or more of the rheumatic disorders, viz. chorea, endo- or peri-carditis, pleurisy, tonsillitis, erythema, nodules, &c.

It not infrequently occurs in the course of scarlet fever, and may be a sequela of an attack of quinsy.

Phthisis is not uncommonly associated with attacks of rheumatic fever.

An attack is frequently determined by exposure to cold and wet, the patient catching a “chill.” This is especially likely to be the case if there has been preceding privation or prolonged arduous labour.

BACTERIOLOGY AND PATHOLOGY.

The usual initial seat of invasion by the organism is the tonsil and fauces. The diplococcus then enters the blood stream, and is distributed to all parts of the body, but shows a special selective affinity for the fibrous tissues and serous membranes. The changes wrought in the tissues are partly the result of the growth and multiplication of the coccus, and partly due to the elaboration of chemical

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bodies. The exact nature of the chemical reactions is not known. Walker and Ryffel regard the process as an oxidation of sacer-lactic acid into formic and acetic acids, and they have shown that the rheumatic micro-coccus produces in culture media relatively large quantities of formic acid and another fatty acid, and that animals infected with these micro-organisms have these acids in their blood, and that they are also present in the urine of patients suffering from acute rheumatism, but not in normal urine. The same observers have succeeded in isolating from the blood an albumose which, when injected into animals, has the power of exciting hyperpyrexia.

Bacteriology.—Space will not permit of a detailed account of the bacteriological researches which have been made into the causation of rheumatic fever, but a brief review of some of the more important and recent work is desirable. The blood, urine, joint effusion, cerebro-spinal and pericardial fluids, throat exudation, and diseased valves have been the materials most commonly examined. Achalme, Thiroloix, Bettencourt, and Hewlett have described a spore-bearing anærobic bacillus as the exciting cause of

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acute rheumatism, but their conclusions have not been generally accepted nor have their results been substantiated by subsequent observers. Many workers have found cocci in the exudations, and some have formulated the theory that acute rheumatism is an attenuated pyæmia; chief amongst these is Stengel. There is, however, a preponderating weight of experimental evidence in favour of the view that the specific organism of rheumatic fever is a diplococcus which is capable of assuming a streptococcal form, and which may possibly in course of further involution acquire a bacillary type. Klebs, Popow, Netter, and Dana have described a streptococcus; Riva, Triboulet, Coyou, and Apert described a diplococcus; Wassermann, Westphal, and Malkoff, a diplococcus which could be made to assume a streptococcal form. Recently, Poynton and Paine, Beattie, Ainley Walker, and Shaw have described a diplococcus as the specific organism exciting acute rheumatism. This organism, which has been styled the diplococcus rheumaticus, is apparently identical with that described by Wassermann, and very probably corresponds to the diplococci and streptococci found in acute rheumatism by earlier ob-

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servers. I have myself been able to isolate this diplococcus from the urine of a patient suffering from rheumatic fever, and from the blood of two patients with ulcerative endocarditis following attacks of acute rheumatism. It is, however, always difficult to demonstrate the cocci in the blood and effusions, and better results are obtained by cutting and staining sections of local lesions, such as inflamed synovial membrane, cardiac vegetations and subcutaneous nodules.

The diplococcus *rheumaticus* measures .5 to 1μ in diameter. It is found in pairs or short chains, and may be isolated from the blood, urine, joint fluids, and tonsils of cases of acute rheumatism, or from the valves in endocarditis, the effusion in pericarditis, and the blood in chorea. It grows best anærobically in a medium of broth and milk acidified with lactic acid, but may be grown ærobically on blood agar, peptone agar of one per cent. alkalinity, milk broth, or gelatine. The growth on blood agar is characteristic, the small discrete, colourless, transparent colonies gradually spreading as a film over the surface, and converting the red blood into a rusty-brown or greenish-brown background. In alkaline broth a precipitate forms, the

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broth remaining clear and gradually becoming acid in reaction. Neutral milk is coagulated in forty-eight hours. In liquid media streptococcal forms appear. In the tissues solitary coccal forms appear, and in old cultures involution forms like diplobacilli are found in chains. The *diplococcus rheumaticus* does not form gas or indol. It stains readily with aniline dyes, and is not decolorised by Gram's method.

Inoculated into rabbits and monkeys by intravenous injection it produces myocarditis, pericarditis, endocarditis, arthritis, chorea, pleurisy, and iritis, lesions identical with those found in rheumatic fever. Inoculations into animals are not, however, always successful. The nature of the acid produced by the *diplococcus* has not been exactly determined, some observers maintaining that it is lactic acid, others formic or acetic acids. The cocci chiefly affect the connective tissues of the body, but although the changes wrought are lasting, the life of the organism itself in the tissues is very short.

The chief advance in the bacteriology of rheumatic fever made in recent years is the demonstration of the fact that the *diplococcus* is a specific organism. The evidence brought

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forward to prove this point is as follows:— Attenuated cultures of the pyogenic cocci if inoculated into animals do not produce the lesions peculiar to rheumatic fever, whilst those of the *diplococcus rheumaticus* have been shown to excite myocarditis, pericarditis, endocarditis, arthritis, and pleurisy. These lesions excited in animals are strictly comparable histologically with those found in acute rheumatism in human beings. The *diplococcus* is found associated with such rheumatic lesions as chorea and subcutaneous nodules. It is distinguished from other streptococci by the fact that it can flourish in a fluid medium in which pyogenic streptococci have been grown (Marmorek's test).

Several facts in the epidemiology and clinical history of rheumatic fever point to the disease being of an infective nature, and these have been ably dealt with in detail by Newsholme in the Milroy Lectures of 1895. He points out that rheumatic fever appears in epidemic waves, recurring every three, four, or six years. Thus in England the years 1855–6, 1874–76, 1888, 1893, and 1900 were years of high death-rate from this disease. Epidemics occur as a rule in years of minimum rainfall, when the soil is dry,

ACUTE RHEUMATISM

the ground-water low, and the earth temperature high. This would point to the saprophytic nature of the specific organism, and to its requiring certain conditions of temperature and moisture in order to obtain a maximum growth. The seasonal curve of rheumatic fever closely resembles that of other infectious diseases such as scarlet fever (with which it is closely associated) and enteric fever; and like these the disease is subject to wide variations of type.

Many cases are now on record of the apparently direct infection of rheumatic fever from one person to another. Hawthorne (in the *British Medical Journal*, December 26, 1903) gives particulars of five cases and a probable sixth occurring in or near one house, with intervals of from a few days to one week of each other, and in one family. Newsholme has published an interesting table showing the frequency of multiple attacks in one house.

The heavy incidence of the disease on young persons and the special proclivity of certain families and persons to infection, are characteristics shared with many of the acute fevers.

Clinically the features of the disease are

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those of an infective disorder. Thus it is frequently ushered in with an attack of tonsillitis as if it were through these structures that infection took place. The course of the fever, and the successive implication of joints or serous membranes is suggestive of a pyæmia. The relapses are paralleled by the relapses seen in other diseases, such as enteric fever, and the fact that no immunity is conferred by an attack is similarly met with in diphtheria. It is worthy of mention, too, that the disease is controlled by a drug of marked antiseptic value, viz. salicylic acid, and in this it resembles diseases such as malaria, which are commonly associated with parasitic invasion.

From a consideration of the foregoing data, we are led to conclude that rheumatic fever is an acute infection of the tissues by a specific organism, the *diplococcus rheumaticus*, and this view affords the most satisfactory explanation of the various phenomena of the disease. Other theories of the pathology of rheumatism have been propounded. Mitchell held that exposure to cold and wet acting on the cutaneous nerves set up lesions in the spinal cord, and that the many rheumatic manifestations were secondary to these.

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Prout originated the idea that rheumatic fever was due to the presence of lactic acid in the blood, and Latham and Haig attribute the disease to excess of uric acid. Although these theories have received considerable support, the evidence adduced on their behalf is far from conclusive, and the same remark applies to those theories which attribute the disease to toxins, the products of perverted metabolism, which are regarded as acting directly, or through the nervous system.

MORBID ANATOMY.

Joints.—The structures most affected in the joints are the fibrous and serous structures—namely, the synovial membranes of the joints and of tendons around the joints, the ligaments, and the muscles and tendons in immediate contiguity. The synovial membrane is thickened and relaxed, deeply injected, and infiltrated. There is an excess of fibrinous exudation into the joint sac, the fluid containing many leucocytes but not becoming purulent. In the structures surrounding the joint, ligaments, tendons, and muscles there is considerable oedema, with swelling of the connective tissue cells, a small-celled proliferation, and invasion by leucocytes.

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It is seldom possible to demonstrate the micrococcus in the fluid drawn off from the joint, but in animals in whom the disease has been artificially produced, the microbial invasion is seen to affect the synovial membranes, ligaments, tendons, and muscles.

Pericardium. — Rheumatic pericarditis commences with an acute vascular dilatation, accompanied by minute haemorrhages. Upon this there follows an inflammatory exudation, evidenced by swelling and infiltration of the serous membrane, outpouring of more or less highly albuminous fluid, and deposition of layers of fibrinous material, through which are scattered small round cells or leucocytes. Micrococci can generally be demonstrated in the exudate if the fluid be incubated for twenty-four to forty-eight hours. The fluid may subsequently be absorbed, and the plastic effusion entirely disappear. Sometimes patches of thickening (milk spots) are left, or as the fluid disappears, and the two surfaces of the pericardium come into contact, they tend to adhere, the lymph becomes organised, and adhesions form. Such adhesions may be partial, or so complete as to entirely obliterate the pericardial sac. In either case

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they interfere with the work of the heart, and lead to hypertrophy and dilatation. Generalised adhesions are associated sooner or later with interstitial fibrosis and degeneration of the muscle fibre of the heart.

Myocardium.—The heart muscle rarely escapes in an acute attack of rheumatic fever. In the early stages the muscle, as seen post-mortem, appears thickened, softened, and deeper in colour, consequent upon the free capillary distension. Then ensues an exudation of small cells between the muscle fibres. The muscle fibres become enlarged and swollen, lose their transverse striation, and become granular. In cases of older standing, the heart muscle will look paler and feel harder, and microscopically it will be found that there is a fatty degeneration of fibres with increase of the interstitial fibrous tissue. These changes may be found throughout the whole of the heart wall, or immediately beneath the visceral pericardium, or in areas wide apart in the wall.

Endocardium.—The changes are most marked on the mitral and aortic valves, it being quite exceptional to see lesions on the right side of the heart. The first naked-eye changes consequent upon invasion of the

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valves by the *micrococcus rheumaticus* is a slight swelling along their free borders, and the appearance of yellow or pinkish beads as excrescences along the lines of contact. As the disease progresses the new tissue becomes fibrous in character, producing thickening, rigidity, and shrinking of the valve, or, increasing in size, the new tissue may form large papillary excrescences, which undergo further fatty and calcareous change. In either case the result is to leave the valve permanently damaged and incompetent.

A section made through a valve affected with rheumatic endocarditis will show the following changes:—(1) A deposition of fibrin on the surface; (2) A proliferation of small cells and collection of leucocytes in the subendothelial layer; (3) Development of blood-vessels within the tissue, which becomes fibrous; (4) The thickened endocardium may become atheromatous, and finally calcify. Sometimes the atheromatous patches soften and break down, leaving an ulcer.

In malignant endocarditis, when due to the *diplococcus rheumaticus*, there are found on one or more valves large circumscribed fleshy vegetations, or abrasions, or ulcers leading to perforation or rupture of the



FIG. I. SECTION THROUGH A VEGETATION ON THE MITRAL VALVE, SHOWING NUMEROUS DIPLOCOCCI AND CHAINS IN THE NECROTIC TISSUE. (POYNTON)

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valves. Microscopically the structure of these lesions does not differ from those found in simple rheumatic endocarditis; but they are to be distinguished by the fact that whilst in simple rheumatic endocarditis the diplococcus is only to be found in the deeper part of the section, in malignant endocarditis the free edge of the vegetation and the necrotic tissue may be found crowded with the cocci (fig. 1). The superficial position of these organisms renders easy their dissemination in the general blood stream, and thus gives rise to numerous white infarcts in distant organs.

Subcutaneous Nodules.—Poynton compares the structure of the rheumatic nodule to that of the lesions found in rheumatic peri- and endo-carditis. The centre of the nodule will be found to be made up of a homogeneous mass of fibrin and necrotic tissue, next towards the periphery there is a zone of small-celled infiltration, and at the periphery swollen hyaline fibrous tissue with distended vessels. He regards the central fibrinous exudate as the basis of the nodule, and the cellular infiltration and fibrosis as restorative changes. Thus those nodules that appear and disappear in a few days are

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mere deposits of inflammatory exudation rapidly poured out and rapidly absorbed, whilst the more lasting ones depend on a subsequent formation of fibrous tissue around the mass of fibrin.

Pleurisy.—In the pleurisy of acute rheumatism there is seldom any large effusion of fluid. The histological features do not differ from those of pleurisy arising from other causes, the pleura showing desquamation of epithelium, connective tissue swelling, small-celled infiltration, leucocytic invasion, and deposit of fibrin.

The kidneys show cloudy swelling with fatty changes in the tubule cells. There is sometimes early arterio-capillary fibrosis.

The most striking feature brought out by the microscopical examination of the tissues affected by rheumatic fever is the identity in structure exhibited by the lesions from whatever organ they may be taken.

SYMPTOMS.

The onset of rheumatic fever may be sudden or gradual. Generally after a few days' *malaise* the patient complains of pains and stiffness in the limbs and back and

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slight shivering. There is often a complaint of sore throat. Gradually the pains become more localised to the joints, passing from one joint to another, and a definite arthritis is established. The patient lies helpless in bed, unwilling to move, the temperature rises to 102° F. or 103° F. There is a profuse sour-smelling perspiration, a tongue thickly coated with white fur, and obstinate constipation. If the condition be now recognised and salicylates administered, the temperature falls to the normal in three or four days, and the attack, after perhaps one or more relapses, comes to an end.

Whilst such is the character of a mild attack of acute rheumatism, the course of the disease may be very different; indeed, there are few diseases in which both the local and general symptoms may be more severe and intractable, or in which the complications and sequelæ may more seriously endanger the life of the patient. These symptoms and complications will now be considered in detail.

Joints.—The joints most prominently attacked are in order of frequency those of the knees, shoulders, ankles, wrists, fingers, and elbows. The skin over the joint has a

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pinkish flush, and can be felt to be hotter to the touch than the surrounding parts. There is swelling due to effusion within the joint and to infiltration of the surrounding structures. The veins stand out prominently over the joint, but the tissues do not pit on pressure. The pain consequent upon the arthritis is variable; sometimes being of such severity as to necessitate the administration of morphia, at other times being slight. The pain is increased on movement, and the joints are exquisitely tender. Usually the limbs are held in such positions as will put the least possible strain upon the inflamed parts; thus the knees and elbows are flexed and the ankles extended. A characteristic feature of the arthritis is its tendency to move from one joint to another. Thus the inflammation may attack the wrist one day, the shoulder the next, and the ankle or knee on the following day; the symptoms subsiding in one joint as they appear in another. As a rule several joints are implicated together. The symptoms are aggravated at night. A joint may be painful although no signs of inflammation are to be detected, and in joints that have been inflamed the pain, especially pain on movement, lingers

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on when the other symptoms have subsided. After the subsidence of the attack some stiffness of the joint remains, and in some cases the swelling in and around the articulation persists so that the condition simulates that of rheumatoid arthritis, especially in the interphalangeal joints of the fingers, which assume a fusiform shape.

Temperature.—The temperature in rheumatic fever is of the irregularly remittent type, higher at night than in the morning. In acute cases it ranges between 100° and 104° F., and in subacute between 100° and 102° F. The fever is proportional to the extent and severity of the lesions. In cases treated with salicylates, the temperature has generally fallen to normal by the fourth day. But it may rise to 99° F. or a little higher on succeeding days, and again become febrile with any recrudescence of the arthritis. The advent of complications such as peri- or endo-carditis, tonsillitis, or pleurisy, is signalled by a return of the pyrexia. Hyperpyrexia, the temperature rising to 108° or 110° F., is peculiarly associated with rheumatic fever. This condition is dealt with on page 44.

Skin.—The skin during the febrile period

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is bathed in perspiration, which may be sufficiently profuse to soak the clothing and damp the bedding of the patient. If attention be not paid to preserving the cleanliness of the skin, and if the clothing be not frequently changed, the sweat acquires a sour, acrid smell.

This profuse perspiration is often accompanied by the appearance of successive crops of sudamina, especially about the trunk.

The sudamina are small vesicles closely set together, with clear contents, which gradually become opaque and milky. Later they sometimes simulate small pustules, with a surrounding zone of redness.

Other cutaneous lesions associated with acute rheumatism are purpura, and varieties of exudative erythema. Rheumatic purpura (*Peliosis rheumatica*) may appear as raised red papules, which do not fade on pressure, or as purpuric spots. The rash appears around the joints, especially the knees and ankles, and to a less degree upon the trunk, and there may be successive crops of spots. A purpuric erythema, circinate in character, is also occasionally observed.

The varieties of erythema, including urticaria, which occur in acute rheumatism do

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not call for special description. Erythema nodosum will be described under "The rheumatic state in childhood."

Digestive System.—The tongue is flabby, thickly coated with white fur, red at the tip and edges. There is loss of appetite and constipation. Dilatation of the stomach is sometimes a sequela of acute rheumatism, as of other fevers.

Throat.—There is a close connection between tonsillitis and acute rheumatism. Thus tonsillitis may immediately precede the attack in such a way as to suggest that the specific virus obtained entry by this means. This is particularly the case with children. The tonsillitis may again precede the attack of rheumatism, chorea, or endo-carditis by some days or weeks, or the sole connection may be that the patient in the intervals between manifestations of acute rheumatism is subject to attacks of tonsillitis, chiefly of the follicular type. Rheumatic subjects also are more liable than others to attacks of quinsy.

The rheumatic diplococcus has been isolated from cultures made from the inflamed tonsils, and possibly it may remain there after symptoms of tonsillitis have abated, and be a source of infection at a later date,

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or keep up the condition of chronic rheumatism. If the fauces be examined at the commencement of an acute attack, it is not uncommon to find an erythematous redness covering the soft palate, pillars, and posterior wall of the pharynx, together with some œdema of the uvula, a condition of rheumatic pharyngitis.

Accompanying an attack of rheumatic fever, or in rheumatic subjects independently of the acute attack, there may arise an acute inflammation of the crico-arytenoid joint. The symptoms are hoarseness, pain on swallowing, painful cough, and tenderness on pressure over the sides of the thyroid cartilage. With the laryngoscope there is seen to be redness and swelling of the arytenoid on the affected side, with impairment of the movement of the corresponding vocal cord. The symptoms generally abate under the administration of sodium salicylate, but occasionally the joint becomes ankylosed.

Respiratory System.—Bronchitis is an occasional accompaniment of rheumatic fever, and as a rarer complication œdema of the lungs. Pleurisy and pneumonia are especially likely to supervene in cases complicated by pericarditis. Lebert states that 10 per cent. of

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all cases of acute rheumatism develop pleurisy. It is most common on the left side, and may supervene at any period of the attack. The fluid is seldom so abundant as to necessitate aspiration.

Nervous System.—At the outset of an attack there is sleeplessness, consequent upon the pains in the joints. Delirium is absent unless the temperature be very high, or the patient alcoholic. If with a rising temperature there be headache, delirium, restlessness, insomnia, or convulsions, the onset of hyperpyrexia should be suspected.

Coma and convulsions may however occur in rheumatic fever apart from hyperpyrexia.

Chorea is not uncommon in young adults, and the condition is dealt with on page 87.

Urine.—During the sweating stage, the urine is strongly acid, scanty, high-coloured, and loaded with urates. The specific gravity is high, and there may be a trace of albumen during the febrile period. The total solids are increased, this being due to a great extent to the large increase of sulphates and urates, and to lesser extent to the larger amounts of urea and uric acid. The chlorides are diminished at first. Very rarely a

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parenchymatous nephritis is observed, and it has been thought by some observers that the rheumatic diathesis is one of the predisposing causes of contracted granular kidney. It seems probable to us that there is a true rheumatic nephritis excited by the specific micrococcus.

The Blood.—There is marked increase in the amount of fibrin present in the blood, and coagulation is slower than normal.

During the febrile period there may be a diminution of the number of red cells (a result which is partially masked by the concentration of the blood), which is clinically apparent as a rapidly developing anæmia. There is always an increase of the white cells, especially the polymorphonuclears, but the leucocytosis seldom exceeds 25,000. From a large number of counts, Cabot gives the following averages. In acute rheumatic fever, red cells, 4,400,000; white, 16,800; hæmoglobin, 67 per cent. Subacute rheumatism, red cells, 4,400,000; white, 9760; hæmoglobin, 62 per cent. From a series of cases under my own care the figures were: in acute rheumatism, red cells, 3,475,000; white, 15,280; hæmoglobin, 65 per cent. Sub-

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acute, red cells, 4,060,000; white, 8400; haemoglobin, 74 per cent.

Cardiac Inflammations.—The most serious complications of acute rheumatism are those affecting the heart, not on account of the immediate danger to life, but because, from the progressive character of the changes excited, there may result chronic valvular disease, adherent pericardium and degeneration of the muscle substance.

Endocarditis.—Endocarditis is the direct result of the invasion of the endocardium by the diplococcus rheumaticus. The parts chiefly affected are the valves, especially along their "lines of contact," and to a lesser degree the chordæ tendineæ. The right side of the heart suffers less than the left, probably because the latter is more subjected to strain. Children and young adults are more subjected to endocarditis than are older persons. Church, in "Allbutt's System of Medicine," taking first attacks of rheumatic fever, found signs of endocarditis in—

75 per cent. of cases under 10 years of age.

54.13	„	between 10 and 20 years of age.
30.66	„	„ 20 and 30 „
33.33	„	„ 30 and 40 „
12.5	„	over 40 years of age.

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In acute rheumatism, for all age periods, the endocardium is affected in about half the cases.

Inflammation of the endocardium commences most commonly during the early days of an attack of rheumatic fever, but may commence at any period of the attack or even after apparent recovery. Its onset is insidious, and may be marked by no characteristic symptoms and signs, and for this reason it is desirable in all cases of rheumatic fever to make routine periodical examinations of the heart with the stethoscope, and to keep a daily record of the respirations and pulse rate. The mitral valve is that most frequently attacked, and next in frequency comes the aortic valve; but it is not uncommon for both to be affected. Mitral regurgitation is commoner than mitral stenosis, and the presence in adults of a well-marked presystolic bruit is generally indicative of a pre-existing lesion of some standing. The earliest signs of endocardial inflammation are: an increase in the area of cardiac dulness and diffuseness of the heart impulse; prolongation and muffling of the first sound at the apex; accentuation of the second sound; increase

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of the rate of the heart beat, and irregularity of the heart and palpitation on exertion. Occasionally there may be a rise in temperature, but there is seldom complaint of cardiac pain.

Later, a distinct bruit is heard, most commonly the soft blowing murmur of mitral regurgitation. The bruit may be audible one day and inaudible the next, and may finally disappear if the endocarditis subside and the exudation on the valves be absorbed. More commonly, however, the bruit persists and becomes more accentuated, and the endocarditis results in a permanent valvular lesion, with its accompanying results of dilatation, hypertrophy and "back-working."

Endocarditis may accompany arthritis or any other of the rheumatic manifestations —chorea, subcutaneous nodules, or tonsillitis. It seems probable, too, that the endocarditis may arise alone, and with such slightly marked general and local symptoms as to excite no attention. For this reason it is important that rheumatic subjects should have the heart examined from time to time, although there may have been no intervening illness to excite suspicion.

Malignant endocarditis.—This condition

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may arise from infection by the diplococcus *rheumaticus* as by other organisms. It occurs in those suffering from old valvular lesions, or may arise during a first attack of rheumatism. Poynton and Paine were able to set up a malignant endocarditis in animals by the injection of cultures of the rheumatic diplococcus, and showed that the same organism might excite either an attack of acute arthritis or simple or malignant endocarditis. The onset of malignant endocarditis may be suspected if during an attack of rheumatic fever an endocardial bruit become markedly accentuated, the pyrexia increase, and rigors appear. Further confirmatory symptoms are infarction of various viscera, enlargement of the spleen, haemorrhages into the skin, wasting, anaemia, and prostration. The presence of the diplococcus *rheumaticus* may be determined by drawing off 5-10 c.c. of blood from a vein, and inoculating it upon suitable media.

R. T., a woman aged thirty-one, was admitted to the Bristol General Hospital on March 16, 1904. There was a history of acute rheumatism on both the father's and the mother's side, and the patient herself had suffered from rheumatic fever when five

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years old, and from scarlet fever and subsequent nephritis. She had been subject to repeated attacks of tonsillitis.

Five weeks before admission to hospital she had an attack of rheumatism affecting the ankles and elbows; two weeks later she had to lie up in bed on account of shortness of breath and swelling of the legs, and a week later she had pleurisy.

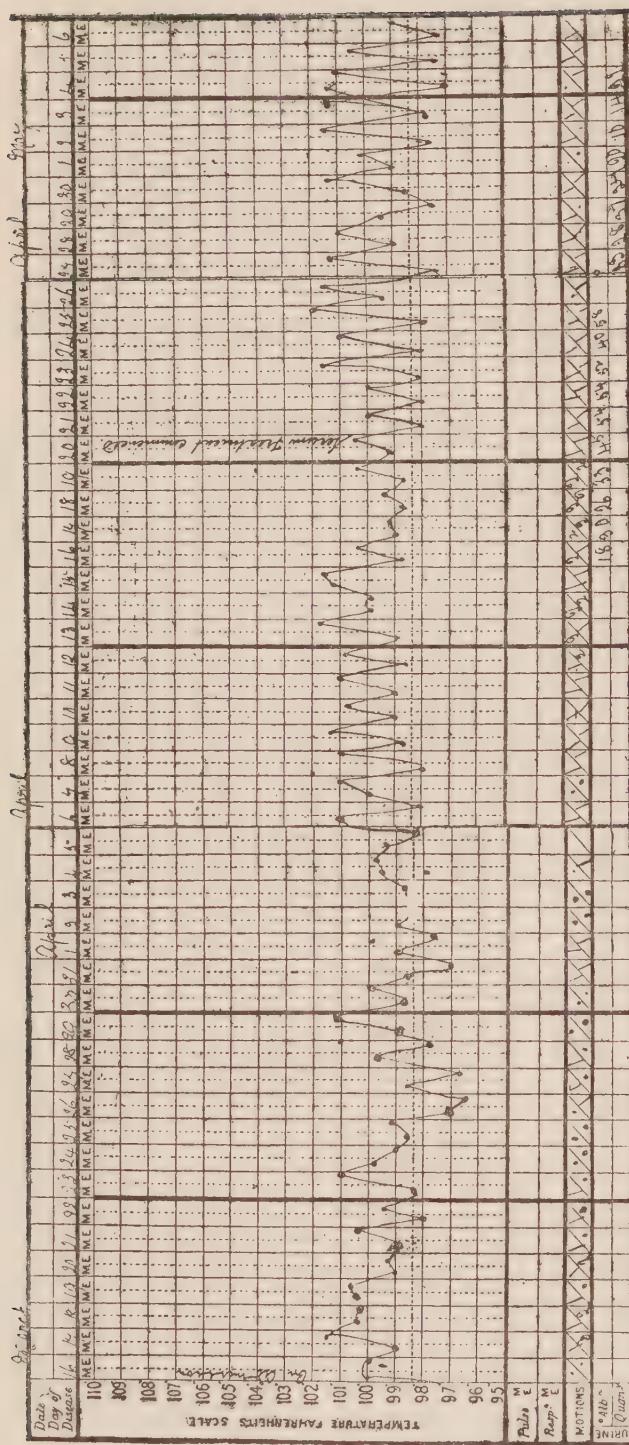
The temperature from the 8th to the 16th of March varied from 100° F. to 103° F.

On admission the patient was markedly sallow and wasted. There were no signs or symptoms of arthritis. A loud blowing systolic bruit was audible at the apex of the heart, and was conducted round to the spine. The heart was dilated, and the pulmonary second sound slightly accentuated. There were a few crepitations over both lungs, especially at the bases. The spleen was just palpable. Temperature, 100°. Pulse, 112. Urine, specific gravity, 1011; trace of albumen, casts. A fortnight after admission, a crop of small purpuric spots was noticed on the chest and arms, and these recurred chiefly over the trunk until the patient died. On April 6th there was a severe attack of pain in the region of the spleen, and a systolic

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thrill was felt over the precordium. On April 7th the right brachial artery was blocked by an embolus just at the point of bifurcation, and a small aneurismal swelling subsequently developed at this point. On April 21st, and on several occasions afterwards, attacks of hæmaturia pointed to the occurrence of renal infarcts. A large subcutaneous nodule was noticed on the right side of the forehead on April 26th, and two days later a second nodule appeared on the left side, and for the first time there was pain and swelling of the joints (knees). The patient gradually sank from exhaustion, and died on May 6th. The course of the temperature is seen by the chart (page 37).

The blood was examined on two occasions, 5 c.c. being withdrawn from a vein on each occasion. The specimen taken on April 5th was sterile, whilst from that taken on April 30th, a pure culture of the *diplococcus rheumaticus* was obtained. A post-mortem examination showed large vegetations on the mitral valve, and abundant warty growth on the interior of the left auricle; there were multiple infarcts in the spleen, some of which were suppurating, and many smaller infarcts in the kidney. A pure culture of the diplo-



From case of Malignant Endocarditis, Acute Rheumatic Arthritis, Pleurisy, Subcutaneous Nodules. Case of R. T. (page 34).

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coccus rheumaticus was obtained from the mitral vegetations and the kidney, and a mixed culture of the diplococcus and the micrococcus tetragenus from the spleen. The treatment had been the administration of salicylates and Menzer's antirheumatic serum.

Pericarditis.—Inflammation of the pericardium is generally later in its onset than endocarditis, with which it is so frequently associated. It is more common in children than in adults, and further details of the condition will be found in the pages devoted to the rheumatic manifestations in childhood. Between the ages of fifteen and twenty-five pericarditis is commonest in females, but at all other age periods the greater incidence is upon the males. Persons engaged in laborious work appear to be particularly liable to this complication. In its onset pericarditis is often insidious, the initial stages being marked only by a slight rise in the fever and increase of the pulse rate. The presence of the complication may only be discovered when examining for a cardiac bruit. The symptoms of pericarditis when fully established are as follows: Pain and tenderness over the cardiac area; some

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dyspnoea, cyanosis, and sense of oppression and tightness in the chest ; the patient is restless and anxious ; the heart's action embarrassed. A to and fro friction sound, varying from time to time in intensity and site, is heard over the heart, especially at the base ; but as fluid is poured out the friction rub tends to disappear, the heart sounds to become fainter, and the apex-beat to become more diffuse and raised. The pericardial effusion is generally speedily absorbed—the friction sounds returning, and the area of cardiac dulness returning to its former, or nearly its former dimensions. The majority of cases of pericarditis do not go on to the stage of serous effusion, but are evidenced by exudations of lymph which are either localised or diffuse. Whatever be the nature of the attack, there is always the possibility of pericardial adhesions resulting, and whether these be general or merely local, they may seriously embarrass the heart.

The inflammation not infrequently spreads to the pleura or to the mediastinum, or it may originate in the pleura and spread to the pericardium.

The following case has been given here,

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as it serves to illustrate many points in connection with pericarditis, viz. the insidious onset with moderate fever and slight distress; the association of the complication with chorea, pleurisy, and endocarditis; the rapid disappearance of the fluid.

M. C., a girl aged 16, was admitted to the Bristol General Hospital on March 7, 1902, for chorea of three months' duration. At eleven years of age she had experienced a similar attack of chorea. On the day of admission there was found a pericardial rub over the inner part of the second left intercostal space. The heart's apex was feebly felt in the fifth interspace one inch outside the nipple line. At the apex was a mitral regurgitant bruit. The area of cardiac dulness extended upwards to the second rib: to the right, one inch beyond the right edge of the sternum, and to the left to the midaxillary line. There were dulness and the usual signs of fluid at the base of the left lung below the angle of the scapula. The choreic movements were slight. There was cough, but no marked dyspnoea. Pulsation of veins in neck. Pulse, 132; respiration, 40. The patient complained of no discomfort, and was not cyanosed or anxious.

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On March 13th the right border of the heart was an inch and a half from the right sternal border, and the fluid in the left chest had

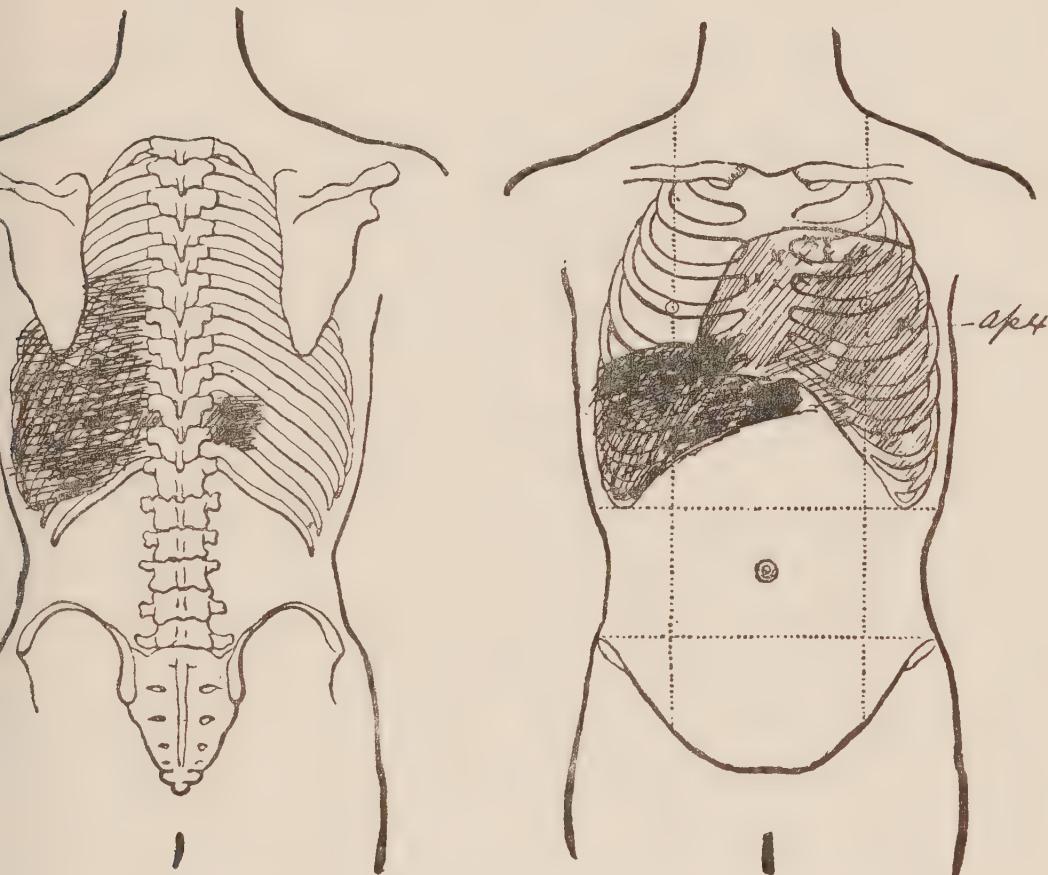


Diagram showing extent of pericardial and pleural effusion in case of patient M. C.

increased (see diagram). The pericardial rub was more extensive over the base of the heart. The apex beat was palpable just external to the nipple. As there was a further accumulation of fluid in the left

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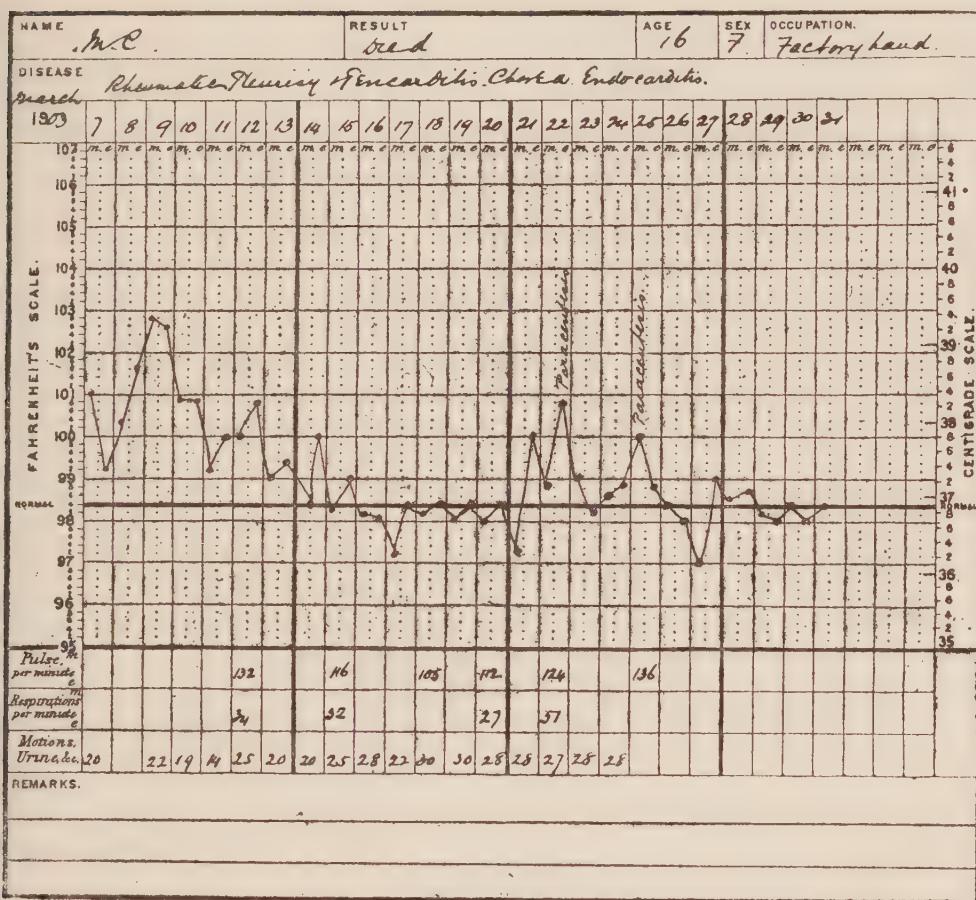
pleura, this was aspirated on March 22nd, and sixteen ounces of fluid withdrawn, and a further aspiration was performed on March 25th. The return of the apex beat, diminished area of cardiac dulness, and increase of the area of the friction rub, showed the rapid absorption of the pericardial fluid, but the patient died of gradual heart failure on March 31st. There had been no return of fluid in the pleura, but signs of œdema of both lungs were present.

Myocarditis.—Inflammation of the heart muscle is generally found to accompany pericarditis, and less commonly it is associated with endocarditis. The fatty or granular degeneration of the heart muscle which follows myocarditis is the frequent cause of the weakening of the walls and dilatation which follows an attack of acute rheumatism.

In rheumatic fever, especially when occurring during the years of childhood, the heart is frequently found to be in a condition of dilatation, although there may be no gross endocardial or pericardial lesion. The area of cardiac dulness is enlarged, the impulse becomes diffused, the first sound at the apex is short and feeble, and the pulmonary

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second sound is accentuated. Under full doses of sodium salicylate the heart returns to its normal size, but with each relapse the dilatation may return. Occasionally the



Temperature Chart. Case of M. C. (page 40).

increase in the area of cardiac dulness may be so great as to simulate a pericardial effusion.

These symptoms are due to the direct

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effect of the rheumatic toxin upon the heart muscle, for which it has a special selective affinity, and they are comparable to the results obtained experimentally on animals in which it is found that the circulation of a solution of lactic acid causes acute dilatation of the heart, which is followed by a contraction if an alkaline solution be substituted for that first used.

Cases of sudden death occurring during rheumatic fever apart from endo- and pericarditis are sometimes due to this acute dilatation.

Relapses.—Under all systems of treatment relapses, accompanied by a return of the pyrexia and arthritis, are very common. They indicate that our methods of treatment, however successful they may be in counter-acting the effects of the circulating toxin, do not exert a bactericidal action on the diplococcus. Relapses can be traced to too early withdrawal of salicylates, improper feeding, or too early rising from bed.

Hyperpyrexia.—If in the course of an attack of acute rheumatism the temperature reach 105° F. and continue to rise, the condition may be described as one of hyperpyrexia. It is probably excited by the cir-

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culation in the blood of a toxin which leads to paralysis of the heat centres : the cerebral symptoms being attributable to the action of the overheated fluids upon nervous structures. Walker and Ryffel found that the *diplococcus rheumaticus* formed in the blood an albumose which, when injected into animals, had the power of exciting hyperpyrexia, and if this be confirmed it would afford an explanation of the condition.

There are no distinctive features in the cases which subsequently develop hyperpyrexia. It is most common in males between the ages of twenty and thirty, and is extremely rare in children under fifteen years of age. Hyperpyrexia is more frequent in the first attack of acute rheumatism than in any subsequent attack, and the second week of the illness is that in which symptoms are most likely to arise. It is frequently associated with pericarditis. The premonitory symptoms are headache, restlessness, and insomnia, with a temperature steadily rising in spite of the administration of increased doses of salicylates. The joint pains may cease or become diminished, and the sweating disappear, but the patient's condition is obviously not

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benefitted. As the temperature rises the pulse becomes very rapid and feeble, the respiration is accelerated, and a venous flush suffuses the face and neck. The nervous symptoms may assume one of two types; either the patient becomes gradually more sleepy, drowsy, and unconscious, or he becomes delirious, violently maniacal, and has convulsions with tonic spasms. In either case, with increasing weakness and tremor, he gradually sinks into a condition of coma with contracted pupils. Under prompt and energetic treatment about one-half of the cases recover, and Fenny has recorded a case where recovery took place after the temperature had reached 111° F. Since the introduction of the salicylate treatment hyperpyrexia is less commonly seen.

Some rarer Complications and Sequelæ in Adults.—Whilst *chorea* and *subcutaneous nodules* may occur in the acute rheumatism of adults, they are so essentially symptoms of the rheumatic state in childhood that they will be dealt with under that head. Chorea occurring at or just after the age of puberty is apt to be very severe, and not infrequently the case ends fatally.

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Aneurysms are occasionally found to arise in the course of acute rheumatism, and are due to arteritis excited by minute emboli. One such case in which the brachial artery was involved was under my care, and I am indebted to Dr. Newman Neild for the photograph of an aneurysm of the radial artery, occurring in a child aged fourteen years, who at the time of its appearance was suffering from acute rheumatism and ulcerative endocarditis (fig. 2).

Phlebitis and Venous Thrombosis, especially in the vessels of the lower limbs, is sometimes seen in rheumatic fever.

Conjunctivitis may occur in acute rheumatism, and a true rheumatic iritis may arise.

Peritonitis, which is said to appear in rheumatic fever, must be a rare complication.

DIAGNOSIS.

The early stages of some of the acute fevers such as enteric fever and pneumonia are apt to be confounded with acute rheumatism on account of the pyrexia, general aching in the limbs, and pains in the joints. The arthritis which sometimes accompanies the early stages of syphilis may, too, be mistaken, but a careful examination

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would reveal the presence of a secondary rash. Gonorrhœal rheumatism should be suspected if the amount of effusion be large, the local symptoms fixed, the constitutional disturbance be slight, and especially if there be implication of the temporo-maxillary or sternoclavicular joints, of the tendon sheaths and plantar fascia. Necrosis and suppuration at the end of the long bones are sometimes mistaken for rheumatism in the joint, but if we remember that rheumatism is seldom monarticular, this error may be avoided. The arthritis of pyæmia is distinguished by the fact that the inflammation of the joint is progressive and does not quickly subside and shift to another joint as in acute rheumatism; a hot, dry feeling of the skin is found in pyæmia, and the presence of a septic focus, and the super-vention of suppuration should suggest the nature of the disease. Rigors are exceptionally met with in rheumatism, but are common in pyæmia.

Acute gout is characterised by the suddenness of the onset and the affection of the smaller joints, especially the big toe joint. The pain is more excruciating than that of rheumatic fever, the redness over the joint

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more pronounced, and there is generally some œdema of the neighbouring skin.

In all cases attention should be paid to the presence of heart mischief, and the reaction of the disease to salicylates should be noted.

From acute rheumatoid arthritis the diagnosis is often at first difficult, but as the implication of the joints progresses, in spite of continued large doses of salicylates, the diagnosis of rheumatic fever becomes less likely, and as the discovery of other phenomena of rheumatoid arthritis, pigmentation, wasting of muscles, and sweating supervene, the correct diagnosis is soon assured.

In children the joint troubles which sometimes occur with acute poliomyelitis and scurvy rickets, with osteomyelitis and the blood effusion into a joint in hæmophilia, should be kept in mind.

Post-scarlatinal rheumatism is not likely to be misunderstood in view of the history of a recent attack of the infectious fever.

PROGNOSIS.

The immediate risk to life in rheumatic fever is not great, the case mortality

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not being higher than two per cent., and this must include many cases in which the heart had been damaged by previous attacks. The risks are greater in the case of children than of adults. The chief indication of an unfavourable character is a rapid and uncontrollable rise of temperature, or persistence of high temperature, together with severe nervous disturbance; hyperpyrexia being one of the most fatal of all the complications of acute rheumatism. Once a diagnosis of malignant endocarditis can be made the prognosis is very grave, as few, if any, rheumatic cases recover. The occurrence of pulmonary lesions with acute rheumatism generally indicates a virulent infection. Pulmonary oedema is often rapidly fatal. Chorea in adults, especially at the age of puberty, may lead to an unfavourable termination, and cases with subcutaneous nodules are often severe, though this is more particularly the case in children. The presence of extensive complications implicating the heart, whilst it adds to the severity of the case, is principally to be feared on account of the grave organic changes and mechanical defects which may follow.

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TREATMENT.

The chief indications in the treatment of rheumatic fever are :—(1) To place the body at rest so that the minimum amount of strain is likely to be thrown upon the tissues most likely to be affected: viz. the heart, joints, and muscles. (2) To neutralise the rheumatic toxin or to kill the specific coccus circulating in the body. (3) To reduce pyrexia and relieve the painful arthritis by means of general and local remedies. (4) To guard against cardiac inflammation. (5) To sustain the strength of the patient by suitable food. (6) To control hyperpyrexia. (7) To guard against relapses. (8) To restore the general bodily vigour and prevent further attacks.

However slight the attack of rheumatic fever may be, it is essential that the patient be kept in bed. The bedroom should be in the warmest and most sheltered aspect of the house, well ventilated, and heated by an open fireplace. A spring-mattress is preferable to a feather bed, and the patient should be between the blankets. The sleeping suit or nightgown should be of flannel, and on account of the profuse per-

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spiration will require to be frequently changed. The body and limbs should be sponged daily with hot water, to which a little vinegar has been added, care being taken to disturb the painful joints as little as possible. To minimise the amount of movement the patient should use the bed-pan and urine bottle. It is impossible to state definitely how long the patient should be kept in the recumbent position, as much will depend upon the severity of the initial fever, and the presence or absence of endocarditis or other complications. Cases in which the initial fever has subsided in from three to five days, and in which there have been no complications, may be allowed to sit up in bed at the end of the third week, and to take gentle exercise in the room at the end of the fourth week. A too early return to convalescence often results in a relapse, and on this occasion the heart possibly may not escape.

In cases complicated by endo- or pericarditis, or in which there has been during the initial stages marked dilatation of the heart, the period of rest must be prolonged. A careful watch must be kept on the area of cardiac dulness, the nature of the impulse,

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and of the first sound at the apex, and of the character and frequency of the pulse. When these have for some days returned to the normal, or to the condition in which they were before the attack, the question of rising may be considered. Generally speaking a rest in bed of eight weeks is not too long for a case in which there has been cardiac complication.

Serum Treatment.—The serum treatment of acute rheumatism is yet in the experimental stage. We have ourselves given a trial to Menzer's streptococcic antitoxin, a bacteriolytic serum obtained from cultures made from the throats of persons suffering from rheumatic angina. Without further experience it would be inadvisable to attempt any criticism of this method, but we have never seen ill effects follow the administration of even large doses. The serum is injected subcutaneously in the thigh. A dose of 2-5 c.c. may be used on the first occasion, and gradually increased until by the fourth injection 10 c.c. is reached. This, the maximum dose, is given every other day until a total of 200 c.c. has been administered. A reaction in the joints sets in four to six hours after the injection, with increase

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of cardiac symptoms, swelling of lymph glands, tonsillitis, and increase of fever. The administration of the serum is not contraindicated by the existence of endocarditis, but it must be used guardedly in cases of high fever, pericarditis, and pleurisy. We should recommend the use of this serum in such cases as do not yield to the ordinary remedies — viz. obstinate cases associated with successive crops of subcutaneous nodules, and cases of malignant endocarditis of rheumatic origin.

Whilst it is yet uncertain whether we possess a serum which is capable of destroying the infective organism of acute rheumatism, it seems probable that in the salicylates we have a remedy which destroys or neutralises the toxin or toxins formed by the diplococcus.

Luff says: "It is quite possible that the salicyl compounds may destroy or neutralise an infective toxin or toxins. In connection with this view it is interesting to bear in mind that salicylates are powerful hepatic stimulants, and that they also possess the power of combining with fatty acids, the seat of whose manufacture is certainly to a great extent in the liver. For instance,

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the fatty acid glycocine (amido-acetic acid), which is manufactured in the liver, combines with sodium salicylate to form sodium salicylurate, which is eliminated in the urine; it may be that one of the toxins of rheumatic fever is a fatty matter which is in like manner seized upon and removed by the salicylate."

This explanation of the action of salicylates in acute rheumatism is more acceptable than that which attributes to the drug a direct antiseptic action, for there are many facts which go to show that salicylates, whilst they relieve or mask the symptoms of rheumatic fever, have no direct and lasting curative action.

✓ Treatment by Drugs.—For the treatment of acute rheumatism the salicylates have to a great extent supplanted other remedies, and all are agreed as to their undoubted value in shortening the febrile period and relieving the arthritic pains. It has been stated that cases of rheumatic fever treated with salicylates are more prone to relapse, but it is doubtful if this could be substantiated. Possibly the rapid disappearance of joint pains under this treatment has led the profession to pay less attention to the necessity for

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prolonged rest, and the too early movement has led to the return of symptoms, and thus thrown discredit upon the drug. There is the same conflict of opinion with regard to the question as to whether salicylates prevent or control the cardiac complications of acute rheumatism. In as far as they shorten the period of pyrexia, it might be supposed that they would lessen the risks of the occurrence of endo- or peri-carditis. It does not seem reasonable to suppose that a diminution of the arthritic symptoms means an increased liability to cardiac complications as held by some clinicians, and most observers will, I think, agree that when combined with alkalies the salicylates do lessen the risks of cardiac inflammation, and favourably influence the course of peri- and endo-carditis when once these conditions have developed.

Sodium salicylate is the drug most generally employed, as it is less apt than salicylic acid to derange digestion. The natural salt, obtained from vegetable sources, is preferable to the artificial acid, which is liable to contain some of the isomeric cresotic acids as impurity. The price of the natural salt, however, makes its general use almost impossible, and the salt employed is that

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described as "physiologically pure," a great improvement on the crude crystals. If combined with an alkali, sodium salicylate is better borne than if administered alone, there being less gastric disturbance, fewer symptoms of salicylism, and greater immunity from heart complications.

At the commencement of an attack of acute rheumatism sodium salicylate should be administered every two hours in doses of twenty grains combined with thirty grains of sodium bicarbonate, dissolved in water and flavoured with compound tincture of cardamoms. This may be continued for the first twenty-four hours, provided that no symptoms of salicylism, such as noises in the head and deafness, are present; and at the end of that time the dose is repeated every four hours until the symptoms have been in abeyance for two days, when the same dose is administered three times a day. The patient should continue to take the smaller dose of salicylate for a fortnight after the disappearance of the pyrexia and joint pains. Any return of symptoms will necessitate again the administration of larger doses of the drug, which may be pushed until symptoms of salicylism are produced.

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Sodium salicylate is incompatible with mineral or organic acids, sp. ætheris nitrosi, iron salts, alkaloids and their salts. Its solutions are discoloured, but its therapeutic action is not impaired by free ammonia, ammonium carbonate, or aromatic spirit of ammonia.

The salicylates if given in full doses or over a prolonged period of time sometimes give rise to unpleasant symptoms, a feeling of fulness in the head, buzzing noises in the ears, deafness, vomiting, delirium with visual hallucinations, and hæmorrhages from the nose, bowel, and kidney. Very large doses sometimes cause a slowing and weakening of the pulse, and an extreme form of dyspnœa resembling the "air hunger" of diabetic coma. Such symptoms are particularly liable to occur in weak alcoholic subjects. Other people possess an idiosyncrasy to the drug which may prevent even the administration of small doses.

With regard to the depressant action of salicylates upon the heart there has been much discussion, especially from the point of view as to whether it is desirable to continue their administration in the presence of active endo- or peri-carditis. My own experience has been that salicylates may be

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administered with the greatest benefit in all acute rheumatic affections of the heart, especially if combined with alkalies. No injurious effect need be anticipated, and such as have been observed were possibly due to the impurities which formerly existed in the artificially prepared drug.

When symptoms of salicylism have arisen the drug should be discontinued for a few hours, and then recommenced in smaller doses. Should the symptoms return again, then one of the substitutes of sodium salicylate should be tried, such as salicin, aspirin, or salophen.

Aspirin (aceto-salicylic acid).—In acute cases with pyrexia aspirin may be administered in fifteen-grain doses every two or three hours, either in cachets, or tablets, or suspended in lemon-juice and water. It is incompatible with alkalies.

As the symptoms subside the dose is gradually reduced in the same manner as when sodium salicylate is used. In our experience aspirin seldom gives rise to unpleasant symptoms.

Spiracine has the same composition.

Salicin.—This drug has not so powerful an effect upon the pyrexia and arthritis as

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has sodium salicylate, and is not so freely soluble in water, but it is far less likely to give rise to symptoms of salicylism, and is more pleasant to the taste. At the outset of the disease it should be given in doses of 20 grains, with an equal quantity of sodium bicarbonate every two or three hours. It may be administered in milk as a powder, or in watery solution, flavoured with liquid extract of liquorice. As the symptoms abate, the quantity of salicin is gradually diminished.

Salophen (acetyl-para-amido-phenyl-salicylic-ester).—Fifteen grains in cachets, or suspended in milk or mucilaginous solution with 30 grains of sodium bicarbonate, may be administered every two or three hours.

Quinine is best given in acute rheumatism combined with alkalies. Five grains of quinine dissolved in two tablespoonfuls of lemon-juice is added to a solution of 30 grains of bicarbonate of soda, and 30 of citrate of potash, and the mixture taken whilst effervescing. This is repeated every three or four hours.

Alkaline Treatment.—This method of treatment, formerly extensively employed, cannot be compared for efficiency with the

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salicylate treatment. Fuller, who introduced the method into this country, gives the following directions: Dissolve 90 grains of bicarbonate of soda and 30 of acetate of potash in 3 ozs. of water. Add one ounce of lemon-juice, and give whilst effervescent. This is repeated every three or four hours until the urine is alkaline, and then gradually diminished. *These are other drugs which should be avoided.*

✓ *General Treatment.* — An action of the bowels should be secured at the commencement of the attack by the administration of a powder containing 2 grains of calomel, and half a drachm of pulv. jalapæ co. From time to time a compound rhubarb pill or a teaspoonful of liquorice powder may be given with advantage, as constipation is frequently troublesome.

Should the pains in the joints not be controlled by the administration of salicylates or their substitutes, opium may be given either by the mouth in the form of pills (half a grain every four hours), or as morphia hypodermically. Opium not only relieves the pain of the arthritis, but by securing sleep and quieting the nervous system it lessens the amount of work thrown upon the heart.

If there be tonsillitis, a gargle or spray

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containing 30 grains of salicylate of soda and 30 grains of bicarbonate of soda to the ounce of water should be used.

When the administration of salicylates is discontinued, tonics and iron will be required to combat the anæmia which is so common a sequel of the fever. At first quinine with an alkali should be given for two or three days, and this followed by one of the milder preparations of iron such as the citrate of iron and ammonia, or the citrate of iron and quinine, together with potassium citrate. If iron is not well tolerated, a mixture of ammonia and bark may be tried, and when the digestive functions are fully restored the patient should take cod liver oil.

✗ *Treatment of the Joints.*—The inflamed joints should be wrapped in cotton-wool and lightly bandaged. If care be taken to prevent pressure from the bed-clothes no further local treatment is usually required, the pains rapidly subsiding as the patient gets under the influence of salicylates. Warm moist applications, although they afford relief, necessitate the frequent movement of the joints, and in cases in which the pain and swelling of the joints persist we have found the greatest benefit from wrapping the affected

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part in lint saturated with a mixture of one part of methyl salicylate and three parts olive oil, covering with oil silk and wool and fixing with a starched bandage. The application is left on for forty-eight hours and then renewed if necessary. As the smell of the methyl salicylate is sometimes objected to, we have recently substituted for it mesotan (salicylic acid methoxymethylester) with an equal part of olive oil.

The mixture of mesotan and olive oil is painted on the joint twice daily, first the front and then the back of the joint being covered, and a light linen bandage then applied, but no cotten wool or air-proof material.

Should the arthritis resist this treatment and threaten to become chronic, the joints are to be painted daily with Iodine, grs. xl; Pot. Iod., grs. x; Sp. Vini Methyl., 3 i, until the skin becomes sore.

An efficient treatment of obstinate joint lesions is to apply around the limb, immediately above and below the joint, a strip of emplastrum cantharidis half an inch wide. When the blister is raised it should be opened and a dressing of zinc ointment firmly and evenly applied by means of strapping and bandage.

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The stiffness, which not infrequently remains after an attack of acute rheumatism, speedily yields to gentle massage and passive movement.

Treatment of Heart Complications : Pericarditis.—This complication is best combated by the application of cold, as advocated by Dr. D. B. Lees. Six to eight leeches are applied over the right side of the heart. When these have been removed, an ice-bag sufficiently large to cover the whole precordium, and filled with small pieces of ice, is placed over the heart, and kept in place by a binder loosely pinned round the chest, and having a hole through which the screw top of the ice-bag passes. At the same time the patient is kept warm by applying hot bottles to the feet and sides, and at stated intervals hypodermic injections of strychnine are administered. The ice-bags must be refilled every hour and a half, the hot-water bottles every three hours. If a little cotton-wool is placed on the upper surface of the ice-bag it will absorb the moisture of condensation. The ice-bags may be removed for a few hours during the night, but the treatment must be persevered with until the temperature remains normal, and the signs of cardiac

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dilatation and inflammation show evidence of abatement. Full doses of salicylate and alkali are continued throughout.

Should the means of carrying out this line of treatment not be available, or if efficient nursing cannot be guaranteed, the precordium should be freely blistered and subsequently dressed with some simple ointment. The discomfort of blistering is minimised if at the same time opium or morphia is freely administered. Opium under any method of treatment is of great value in pericarditis, and if care be taken to avoid narcotisation, no ill effects need be feared from its administration.

Apart from all local applications the most important factors in the successful treatment of pericarditis are, rest in the recumbent position and the free use of the salicylates.

Endocarditis. — Should a cardiac bruit appear, or modification of the first sound at the apex suggest the onset of endocarditis, the patient should at once return to full doses of salicylates, if these have been diminished, and the necessity for absolute rest in the recumbent position more rigidly enforced than before. Blisters should then be applied to the precordium in the method suggested

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by Dr. Caton. A series of small blisters the size of a florin is applied over the front and sides of the left chest in the third, fourth, fifth, and sixth intercostal spaces. Only one blister is applied at a time, the treatment being persisted in for a number of days. Sodium or potassium iodide in doses of from 8 to 10 grains are administered three times daily in addition to the salicylates. The ice-bag used in the same way as in pericarditis may be tried at the outset of endocarditis.

Should there be palpitation and signs of heart failure, digitalis often proves of benefit, or the pulse may be found to improve under the administration of stimulants such as strychnia, ammonium carbonate, or alcohol. Opium is a valuable remedy if there be pain or cardiac discomfort or sleeplessness.

Myocarditis.—This complication is frequently associated with endocarditis or pericarditis, and the measures directed to the treatment of these last named, viz. leeching, the application of cold, or of blisters, are also applicable to myocarditis. Here, as in the treatment of other cardiac complications, prolonged rest is essential to complete recovery. The simple cardiac dilatation seen in rheumatic fever generally subsides rapidly

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under the administration of salicylates and alkalis without local counter-irritation.

*The treatment of
rheumatic heat should
be protracted*
B. N. S. Sept. 21
1918.

Treatment of Hyperpyrexia.—The onset of cerebral symptoms and cessation of articular pains with a temperature rising to 105° F. should be the signals for commencing the energetic treatment of this most dangerous complication. Ten or fifteen grains of sulphate of quinine are first administered, and preparations made for immersing the patient in a cold bath, which, if possible, should be brought to the bedside. The temperature of the water in the bath should be about 70° F., and an ample supply of ice should be at hand in order to keep it at this point. The sleeping-suit having been removed, the patient is lifted into the bath in a sheet. The shoulders should be supported by means of a board placed across the inside of the bath, and the head is bathed continuously with iced water. Should the patient appear blue and cold, or a feeble pulse indicate collapse, stimulants must be freely given, strychnine hypodermically or brandy by the mouth. The patient is kept in the bath until the temperature has fallen five or six degrees, and the thermometer must be incessantly used both to determine

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the condition of the patient and the temperature of the water. Once the required fall of temperature has been obtained the patient is lifted from the bath, placed in bed wrapped in a blanket, and if there be signs of collapse stimulants are freely administered and hot-water bottles applied to the feet. The bath may be repeated several times daily, and frequently during successive days if the temperature require it.

The results of the cold-bath treatment of hyperpyrexia have been most encouraging. According to the Clinical Society's report, five-eighths of the total number of cases investigated, which were treated by this method, made a good recovery, although the temperature had exceeded 106° F. in every instance.

If the conveniences for the bath are not obtainable, or from some other cause this line of treatment cannot be carried out, a cold wet pack may be tried. The patient is wrapped round with a fourfold sheet wrung out of iced water, and again wrapped in a blanket. At the expiration of ten minutes a fresh cold sheet is substituted, and this is repeated six or eight times until a fall in the temperature results. Finally the patient is

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dried and placed between the blankets. Sponging with iced water is sometimes effectual, or rubbing the body with pieces of ice wrapped in flannel. These methods should be combined with the application of ice-bags to the neck and head. Nothing, however, is so successful in the control of hyperpyrexia as the cold-bath treatment, and wherever possible this should be tried first.

Diet.—During the febrile period of acute rheumatism there is generally anorexia, but owing to the sweating and fever the patient is thirsty, and there is seldom difficulty in ensuring that a proper amount of liquid nourishment is taken. The fear that an increased amount of fluid may embarrass the heart may be disregarded, the important point being to freely dilute and hasten the elimination of the toxin. For this reason the patient should be allowed to drink freely of milk diluted with soda-water or Vichy water, or of lemonade. We have found Burney Yeo's plan an excellent one. A pint of milk and a pint of water are mixed, and to these 30 grains of bicarbonate of soda and 10 grains of common salt are added. The mixture is iced and given to the patient,

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a tumblerful at a time. In addition to the above, iced lemonade, made by tearing open a lemon and boiling it for ten minutes in a pint of water and adding 30 grains of bicarbonate of potash, makes an agreeable and refreshing drink.

As alternatives to milk, Benger's or Mellin's food may be tried, or gruel, or vegetable broths. Beef tea and meat extracts are best withheld during the febrile attack, owing to their richness in nitrogenous extractives. Tea, thin cocoa, or Russian tea are all permissible. Stimulants are better withheld unless there be signs of cardiac failure, when brandy in half-ounce doses every three or four hours may be given, and the quantity increased if the signs of prostration and cardiac feebleness become more pronounced.

As the acute symptoms subside and the temperature falls, the dietary may be increased by the addition of bread and milk, milk puddings, cornflour, egg-flip, junket, or bread and butter. A too rapid return to a full nitrogenous diet often seems to determine the onset of a relapse, probably owing to imperfect assimilation of food due to the weakness following the fever.

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A week after the temperature has become normal the patient may be allowed to take a small quantity of meat, fish, or game. This during the whole period of convalescence should only be given once a day.

Preventive Treatment.—There is a strong tendency for attacks of acute rheumatism to be repeated, and the patient may suffer from three or four attacks in the course of as many years. In order to prevent these recurrences woollen or flannel clothing should be worn next to the skin summer and winter, and the patient should be careful to avoid exposure to cold and wet, and to guard against "chill," especially in the summer and autumn months. Excessive fatigue, whether it be bodily or mental, may predispose to an attack, and those who have suffered from rheumatic fever are not fitted to perform heavy manual labour. For young women factory work seems preferable to domestic service, a very large proportion of the female patients suffering from rheumatic fever being domestic servants. If the tonsils are chronically inflamed and large, or if the onset of attacks is accompanied by tonsillitis, it is advisable to have the tonsils removed. The teeth should be carefully attended to,

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and all carious teeth extracted or stopped. Any digestive disorder should be remedied, and constipation guarded against.

The diet should contain less meat than is generally taken by a healthy person, and cured and salted meats should be avoided altogether. Vegetables and fruit, fresh and cooked, must enter largely into the diet, which should also contain a liberal supply of milk, cream, and fat substances generally. Whilst it is not necessary to altogether prohibit sugar, it should be taken in small quantities only, and the same rule applies to pastry and sweets. Alcohol is better avoided.

The house of the rheumatic subject should not be in the heart of the town, but in the outskirts. It should be sunny and well ventilated, and have a concrete basement to prevent the entry of ground air.

At the first warning of a return of rheumatic pains the patient should rest in bed, and commence taking again a mixture of sodium salicylate and alkali. A routine examination of the heart should be made by the medical attendant every six months, whether there have been previous endocarditis or not.



II

THE RHEUMATISM OF CHILDHOOD

WHILST there is no essential etiological difference between acute rheumatism in children and in adults, yet the disease in the child has such a characteristic type, and presents so many distinctive symptoms, that it is convenient to deal with it under a special heading.

Instead of having to deal with an acute attack of fever accompanied by arthritis, we find in the child that rheumatism is evidenced by the occurrence at intervals of isolated symptoms, such as endocarditis, chorea, tonsillitis, exudative erythema, subcutaneous nodules, erythema nodosum, or arthritis. Frequently two or more of these symptoms occur together, but usually a history of their appearance can be traced scattered over the whole period of childhood. This is illustrated by the following case.

A boy of sixteen years was admitted to

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hospital with acute rheumatic arthritis. At six years of age he had chorea, repeated in the following year; at eight years of age he had rheumatic fever, and at about ten years of age he suffered from purpura. In one or other of these attacks he had endocarditis.

That such conditions as chorea, tonsillitis, and subcutaneous nodules are truly rheumatic phenomena, is proved not only by the fact that they occur most frequently in children in whom undoubted symptoms of acute rheumatism are detected, but also from bacteriological evidence, the *diplococcus rheumaticus* having been demonstrated in sections of subcutaneous nodules, in the brain in chorea, and in the exudate of acute tonsillitis. In five consecutive cases of rheumatism in children under fifteen years coming under treatment in 1902, the associated rheumatic symptoms were: 1. Endocarditis and chorea; 2. Arthritis and endocarditis; 3. Chorea, erythema, endocarditis, arthritis, and subcutaneous nodules; 4. Arthritis and endocarditis; 5. Tonsillitis, arthritis, endocarditis, pericarditis, pleurisy, and pneumonia.

The incidence of acute rheumatism is heavier on girls than boys, but this is en-

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tirely due to the fact that between the ages of ten and fifteen girls are twice as liable as boys to articular rheumatism, chorea, and heart inflammations ; at all other periods males predominate. The greater incidence on girls at this age period is due partly to the onset of menstruation, and partly to the increased strain thrown upon them by the small domestic duties imposed upon them in the home.

Rheumatic children are generally the offspring of rheumatic parents, and if, when determining the history, all the rheumatic phenomena are borne in mind, very striking confirmation of this fact may be obtained. For instance, in a family of three children under twelve years of age, one, a boy aged seven years, suffered from arthritis and endocarditis ; a second, a girl aged five, suffered from chorea and endocarditis ; the third, a boy, has escaped. The father has endocarditis ; the mother chronic articular rheumatism ; the maternal grandfather died of heart disease ; the maternal grandmother has rheumatic gout ; three out of five maternal uncles have shown rheumatic symptoms.

The children peculiarly liable to attack are the nervous, excitable, highly-strung mem-

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bers of the family. Indeed, the nervous element is a prominent feature in the history of infantile rheumatism.

Whilst many rheumatic children are wasted and anæmic, a not uncommon type is the child with clear, brightly coloured complexion and auburn or reddish hair. The disease is more common amongst the poorer than the well-to-do classes.

Briefly summarised, the distinctive points in the symptomatology of acute rheumatism in children, as distinguished from the disease in adults, are as follows: 1. The lessened severity of the arthritis and pyrexia; 2. The absence of profuse sweating; 3. The more frequent occurrence of heart complications, rashes, tonsillitis, chorea, and subcutaneous nodules; 4. The isolation of the symptoms, and their distribution over the period of childhood.

We shall now discuss these points more in detail, first emphasising the point that the occurrence of any one of these symptoms in a child should arouse the suspicion of a rheumatic taint, and afford ground for the adoption of preventive measures.

Arthritis and Pyrexia.—Under twelve years of age it is uncommon to see the

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severe, painful, and crippling arthritis such as we associate with the onset of acute rheumatism in adults, and under three years of age arthritis is extremely rare. In the slightest form there is complaint of pain or stiffness in a limb, not perhaps exactly referred to a joint. No signs of inflammation in the joints can be detected, and there is no tenderness or apparent increase of pain on movement. The child is often said to be suffering from "growing pains." More advanced cases show slight swelling of the joints, and pain on movement. The neighbouring fasciæ and tendons are apt to get involved, especially the tendons of the hamstring muscles, and this may lead to a condition resembling talipes equinus, the child walking on the toes with the knees flexed, in order to avoid putting the muscles on the stretch. Similarly the muscles and fasciæ of the neck and shoulder may be affected, giving rise to "stiff neck" or torticollis, or the abdominal muscles, or the intercostal muscles being affected, may cause complaint of "pain in the stomach" or "pain in the side." The knees, ankles, and wrists are the joints usually attacked, and the arthritis is not uncommonly symmetrical.

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The arthritis is seldom of long duration, and unless many joints are attacked, the pyrexia is slight, seldom rising above 100° F., unless there are complications. The profuse acrid sweating that accompanies rheumatic fever in adults is not noticed in children, and hyperpyrexia is almost unknown.

Complaints of vague pains made by children, especially joint pains, should never be disregarded, but should lead to an examination of the heart for signs of endocarditis, and to a search for other symptoms of a rheumatic nature. Cases such as the following are very common: J. S., a boy eight years of age, was brought to the out-patient department of the Bristol General Hospital, complaining of pain in the right wrist. The wrist was slightly swollen, and the pain was increased on movement. No other joint was affected. The temperature was subnormal. On examination of the heart, there was found a loud blowing systolic bruit at the apex, with a quickened pulse rate. There was a strong family history of rheumatism. The joint pain was speedily relieved by salicylates, but the bruit persisted.

Subcutaneous Nodules.—Although nodules are occasionally seen in the course of rheu-

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matic fever in adults, and sometimes in cases of rheumatoid arthritis, they are essentially a manifestation of the rheumatic state in childhood. Still found nodules in 27.5 per cent. of two hundred severe cases of rheumatism in children under twelve years of age, and in the milder cases, such as attend out-patient hospital practice, he found nodules in 10 per cent. The nodules appear as small subcutaneous swellings varying in size from a pin's head to an almond; they are not tender, and the skin over them is not reddened. Their histological structure has been already described (page 21), and closely resembles that of the vegetations on the cardiac valve; indeed, the close histological similarity of the various lesions found in acute rheumatism is a very striking evidence of the specific nature of the infection. Nodules are found in the subcutaneous tissues. Their growth is rapid, so that they may reach the size of a pea in three or four days. They may remain for many weeks or months, coming out in successive crops, each new outbreak being attended sometimes with a rise of temperature. Their disappearance may be rapid or gradual.

Nodules arise principally from fibrous tissue, the skin being freely movable over

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them, and there being no attachment to bone. Sometimes they are so small, or so few in number, that they are overlooked unless especially sought for; at other times they form the striking symptom of the disease, and may be counted in scores. They are most commonly found at the back of the elbow, on the subcutaneous border of the ulna, the curved lines of the occiput, the spines of the dorsal vertebræ, and borders of the scapula and pelvis.

Less frequently they are to be seen or felt on the tendons of the toes and fingers, or in unusual sites, such as the palm of the hand or periosteum of the nose, as in the cases kindly figured for me by Dr. Theodore Fisher (fig. 3). They may occur with such rheumatic symptoms as arthritis and chorea, but in the great majority of the cases they are associated with endocarditis, which, when accompanied by nodules, is apt to be of a peculiarly intractable nature. Cheadle, to whose researches we are largely indebted for our knowledge of infantile rheumatism, regards them as being indicative of an almost certainly fatal termination.

Ganglia on the tendons of the hands and feet are sometimes associated with rheu-

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matism in children, and should not be confounded with the nodules.

Carditis.—One of the characteristics of rheumatism in children, as opposed to adults, is the greater tendency to affect the heart muscle, pericardium, and endocardium separately or together. We have already noted in adults that the rheumatic toxin may cause dilatation of the heart without affection of the endocardium, and this result is even commoner in children. The symptoms are dyspnœa, diffused and feeble apex beat, a frequent, feeble, and intermittent pulse, and increase of the area of cardiac dulness.

Pericarditis.—The onset of pericarditis is insidious, unaccompanied by any great pyrexia, and slowly progressive in its course. These points are well illustrated by the case of a girl, N. S., aged ten years, who was under my care in February 1902. Towards the end of January she had an attack of tonsillitis, followed by pains in the knees and ankles, for which she was kept in bed a week. The pains having subsided, she was allowed to get up and walk about, but complained of pains in the front of the chest and epigastrium, and difficulty of breathing when in bed at night. She was not kept in bed, but

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after a few days brought to the hospital, where it was found that she was suffering from extensive pericarditis and from mitral disease. The pulse rate was 144 per minute, the wave small and thready. Death ensued ten days later, and post-mortem examination showed extensive fibrinous exudation on the pericardium, dilatation of the heart, with granulations on the free edge and auricular surfaces of the mitral valve, broncho-pneumonia of both lungs, and right-sided pleurisy. The temperature, as will be seen from the accompanying chart, only once reached 101° F.

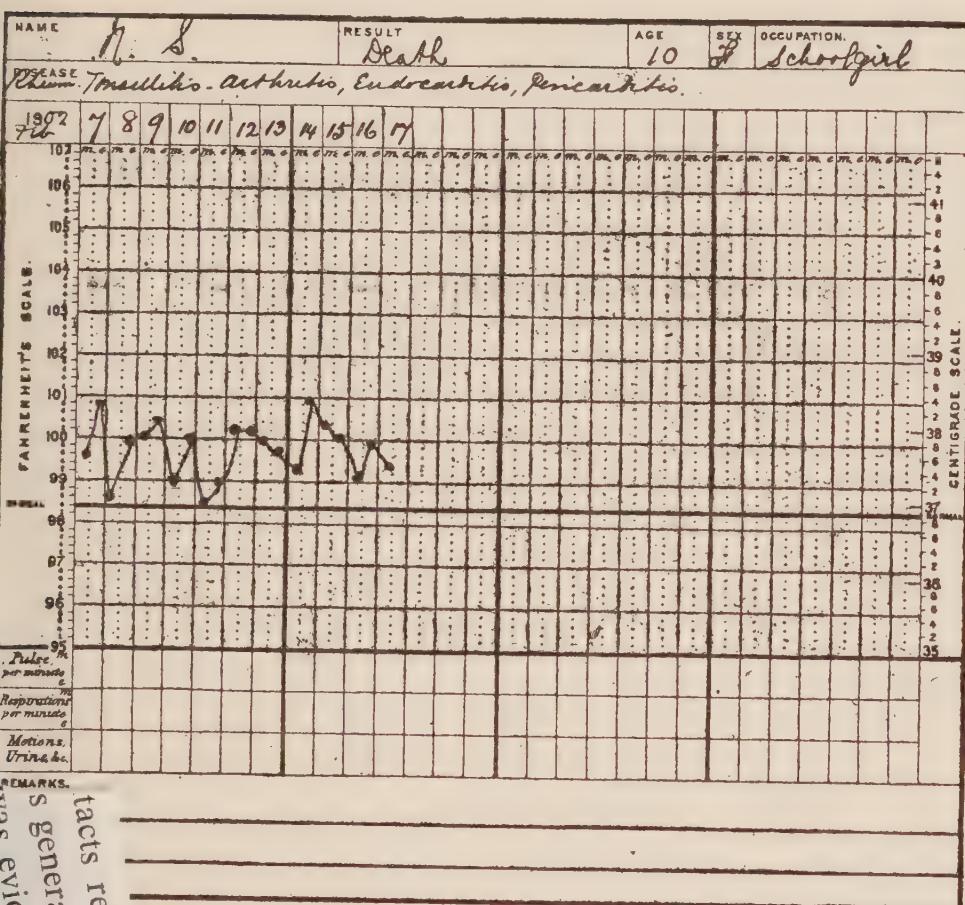
The tendency to rapid and large effusion of fluid is not so marked in the pericarditis of children as in that of adults ; but in the former there is a greater possibility of the condition becoming chronic and leading to a general adhesive fibrosis which may obliterate the pericardial cavity, and ultimately exert such compression of the heart as to interfere with its full development as age advances, or to paralyse its movement.

Pericarditis occurs later than endocarditis as a rule, and both are frequently associated with subcutaneous nodules.

Endocarditis.—Inflammation of the endocardium in acute rheumatism is twice as

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common in children as in adults ; fully three-quarters of all cases under fifteen years of age develop endocarditis. It may accompany



Temperature Chart. Case of N. S. (page 81).

itis or chorea, and in either case it is likely to be overlooked ; not infrequently, however, it accompanies tonsillitis, or appears giving rise only to slight malaise and tact reported in the third paper, above, ^a. The illness may under these conditions generally necessary for transmission. Cultures was evidence that contaminated water was evidence that contaminated water was

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ditions be overlooked or attributed to a "chill," and the unsuspected and untreated endocarditis pass into permanent valvular disease. It should be a matter of routine to examine the heart in all children with febrile attacks, and in a family with known rheumatic tendencies the condition of the heart should be periodically ascertained whether there have or have not been recent illness.

Endocarditis occurs early in the series of rheumatic events, preceding pericarditis. It is a very frequent accompaniment of rheumatic nodules, and the conjunction of the two generally warrants a very grave prognosis. This is not necessarily so, however, and we have had recently in the hospital a child with endocarditis who had several crops of subcutaneous nodules, but who at the end of nine weeks was discharged convalescent, but with the cardiac bruit still audible. After many months the child apparently remains in good health.

The mitral valve is that most frequently attacked, and the soft blowing apical murmur of mitral regurgitation is often the first sign of the mischief present. Any irregularity of the heart, alteration of the first sound, accentuation of the second sound, and any

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pyrexia or quickening of the pulse without obvious cause should lead to a suspicion of early endocarditis. Although mitral stenosis is undoubtedly of rheumatic origin and starts in childhood, it is not, except in cases of congenital disease, until past the age of puberty that the characteristic long rumbling presystolic bruit is heard. The stenosis is the result of slow subacute or recurrent endocarditis of long duration. In children its existence may be suspected if there be reduplication of the second sound of the heart at the apex, and sometimes a slight rumble may also be detected.

Dilatation and hypertrophy of the heart take place more rapidly in children than in adults, but the mechanical effects of valvular incompetence are seldom seen in the young ; dropsy, cyanosis, and dyspnœa being rare, except there be also pericardial adhesions. Dilatation of the heart is sometimes fatal in children, but in fatal cases of endocarditis the end is chiefly marked by gradual wasting, asthenia, and anæmia.

The systolic bruit which is so often heard in chorea is to be regarded as organic in origin ; at least this is the safer view to take. In the rare cases of chorea accompanied by

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an apical bruit in which post-mortem examinations have been obtained, the lesion has been shown to be organic, and the endocarditis has generally been found to affect the mitral valve. These bruits, too, in the great majority of cases persist, and signs of mitral insufficiency appear in later life. Pericarditis, too, is not infrequent in chorea. That some bruits in chorea are due to simple dilatation is probable, for this is a common associated condition.

The probability of complete recovery from endocarditis appears to us to be greater in children than in adults, provided they are treated promptly and efficiently. In a boy of twelve years of age under our care with very slight arthritis, a mitral systolic bruit, and pyrexia, the symptoms completely subsided under salicylates and prolonged rest; and the bruit, which was audible for four weeks from the commencement of the attack, could not be detected when the patient was last seen two years later.

The structure of the early endocardial swelling is, as we have mentioned elsewhere, strictly comparable with that of the rheumatic nodules, and like these it may rapidly be absorbed.

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Chorea.—The association of chorea with rheumatism has been long recognised, and the proportion of cases of chorea in which definite rheumatic history can be traced has been variously estimated between 40 and 70 per cent. It is three times as common amongst girls as amongst boys, and is more frequent in town than in the country. Chorea may occur as an isolated symptom of the rheumatic series, or may be accompanied by endocarditis, pericarditis, subcutaneous nodules, or arthritis. The rheumatic child is essentially of the unstable, nervous type, and the rheumatic toxin or the presence of the rheumatic organism in the brain is sufficient to precipitate an attack of chorea. In the majority of cases of chorea occurring in young children the left heart will be found dilated, but the accompanying mitral systolic bruit is much more commonly due to endocarditis than to incompetence induced by the dilatation.

The symptoms of the chorea of rheumatism do not differ from those of chorea from other causes, and the diagnosis must rest upon a careful investigation of the history, and the examination of the child for signs of arthritis, endocarditis, nodules, or other phenomena of

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rheumatism. The choreic movements may be very slight, only an occasional twitching of the face or hands with over-extension of the fingers, or sometimes even confined to a habit of blinking the eyes or twitching the corner of the mouth and side of the nose (habit spasm). These irregular movements may increase so that the limbs are jerked about incessantly, the action being increased by excitement or voluntary movement, and only checked during sleep. In other cases the most noticeable feature is loss of muscular power, so that the child may be unable to swallow, or is noticed to drop things held in the hand or to drag one leg. The speech is jerky and syllables often omitted, or the child may apparently be unable to speak at all. In severe cases the temperature is raised to 100° F. or higher, even although no complication can be detected.

Children having once suffered from chorea are likely to have one or more recurrences at intervals of months or years, and this is particularly liable to occur if they are subjected to undue pressure of work at school.

Tonsillitis.—Repeated attacks of tonsillitis in a child without any obvious exciting cause should suggest the possibility of a rheumatic

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origin. The tonsils are red and swollen, but with less distension of the lacunæ than is seen in follicular tonsillitis. Sometimes quinsy is developed. A lad, aged fifteen, recently under my care in the Bristol General Hospital, suffering from arthritis and endocarditis, developed an attack of acute tonsillitis, accompanied by return of the arthritis four days after the temperature had become normal. According to his own statement he had quinsy when eight years old, and since then had had "bad throats" two or three times a year, necessitating keeping to his bed. On three occasions he had quinsies which broke and discharged. Nine months from the date of admission he had his first attack of rheumatic fever.

Pleurisy is generally recognised as a true rheumatic affection, and possibly much of the *broncho-pneumonia* of children may have the same pathogenesis.

Skin.—*Erythema nodosum* is characterised by the occurrence of node-like swellings coming out in crops, symmetrically on the legs, feet, and thighs, and occasionally on the upper extremity. These are at first bright red in colour, but gradually assume the colours of a bruise, and fade away. The

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long diameter of the swelling varies from a half-inch to an inch and a half in length, and corresponds to the long axis of the limb. Erythema nodosum is commonest in girls. It may occur independently of rheumatism, although sometimes associated with it. The appearance of the rash should always lead to an examination of the heart, and to inquiry as to symptoms of a rheumatic nature. The association of erythema nodosum and rheumatism is not, in our opinion, very common.

The occurrence of *purpura* and the *exudative erythema* is commoner in children than in adults.

General.—We have already referred to the strong neurotic tendency exhibited by rheumatic children. This no doubt in part accounts for the fact that they are often given to walking in their sleep, and suffer from nightmares to which the name of "night-terrors" has sometimes been given. Repeated attacks of rheumatism leave the children anæmic and wasted, and in the intervals between attacks their appetites are often capricious, the stomach easily upset, the food "passing through them at once," as the parent will state. An attack of acute rheumatism may be ushered in by vomiting

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Nose bleeding occurs more frequently amongst rheumatic children than amongst others, and haemorrhage from the kidney in the absence of symptoms of local disease should excite suspicion of the rheumatic taint. Obstinate headache in children is often of rheumatic origin, and the children may be noticed as being unduly excitable at play, and when sitting to be grimacing or fidgeting incessantly.

Prognosis.—If the condition be early recognised the prognosis is better in the case of children than of adults, but from the insidious nature of its onset and progress, acute rheumatism in children is very apt to be overlooked and the heart lesions consequently neglected.

The occurrence of endocarditis and pericarditis, whilst they add greatly to the immediate risk of disease, are chiefly to be feared on the ground of the possibility of their becoming chronic and permanently crippling the heart. The appearance of subcutaneous nodules, especially if endocarditis be present, is of the greatest import, predictive often of a not long deferred fatal termination.

Cases of arthritis complicated by chorea

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are generally severe, the more so especially in older children.

Relapses in children are extremely common, and in order that early treatment may be adopted, parents should be informed of the varied manifestations of the rheumatic state, and told of their distribution through the whole period of childhood.

* • *Treatment.*—The treatment of rheumatism in children follows on the same lines as that in adults (see page 51).

Prolonged rest in bed, a diet of milk and farinaceous foods, and the administration of salicylates are the main features.

Children are rather more susceptible to salicylism than are adults, but if the drug be combined with an alkali, and if the natural salt be used, this effect is seldom seen. Sodium salicylate may be administered in doses of 1 grain for each year of the child's age, together with 3 grains of sodium bicarbonate or citrate for each year. The taste may be disguised by the addition of extract of liquorice or syrup of orange.

The salicylate should be given every three or four hours until the symptoms abate, and should be continued for fourteen days after the disappearance of pyrexia.

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Lees recommends that in chorea even larger doses of sodium salicylate, 100 to 200 grains in the twenty-four hours with bicarbonate of soda, be given.

Salicin is a less effectual drug than sodium salicylate, but is better tolerated. It may be given in doses of from 5 to 15 grains every three hours in milk and gradually diminished.

The anaemia, wasting, and weakness which follow acute rheumatism are best met by the administration of tonics, malt extract with cod liver oil, Easton's Syrup, Chemical Food, &c.

The treatment of cardiac inflammation is the same as in adults, but the application of cold by means of an ice-bag in carditis is preferable to blistering and leeching, which are very distressing to children.

In intractable cases of carditis, stimulants are generally required, and for this purpose strychnine and ammonia are preferable to alcohol, and these may be beneficially combined with digitalis or strophanthus.

Sodium salicylate should be given in full doses if there be endo- or peri-carditis, and in these conditions small doses of Dover's powder, 2 to 5 grains according to age, if given three times a day afford great relief.

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Goodhart recommends that for night-terrors 5 grains of bromide of potassium and 5 grains of chloral hydrate be given at bedtime for a child two years old, and continued for a few nights in succession. This combination is also useful in cases of chorea if the movements be very violent and the patient sleepless. All cases of chorea are best treated by a more or less prolonged rest in bed and freedom from excitement. Arsenic is beneficial in some cases if administered in large doses, 10 to 15 minims of the liquor three times daily.

The return to a full meat diet must not be too early, but at the same time the period of convalescence in acute rheumatism is much hastened if a generous diet be allowed, and this should include a liberal allowance of milk and cream and digestible vegetables and fruit.

Preventive Treatment. — The rheumatic child should be warmly clothed, woollen or flannel underclothing being provided of such a pattern as to cover not only the trunk but also the arms and legs. Excitement and undue fatigue are to be guarded against, the child being forbidden to take part in the more strenuous games such as football, long

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distance running, or competitive gymnastic exercises. Over-pressure of school work is equally to be avoided, and the highly neurotic type of rheumatic child is better spared the excitement of competitive examinations. Generally speaking, the child is safer as a day-scholar than as a boarder, as slight ailments are more likely to be noticed at home, and greater attention can be paid to individual diet and hygiene.

In the selection of a school and of a home particular attention should be paid to climate and aspect; cold, damp, exposed, bleak positions being avoided, and every effort made to secure the greatest amount of warmth, dryness, and sunshine.

The diet most suitable for rheumatic subjects will be found described on page 69. It should be rigidly adhered to in the case of children.

Dyspepsia, of common occurrence in these children, is generally corrected by small doses of rhubarb and soda. The constipation, which is also a characteristic, must be met by the administration of sulphur tablets, or compound liquorice powder at night, or of magnesia in the morning. All carious teeth should be extracted or stopped, and if large

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tonsils or adenoids are present, an operation for their removal should be performed.

The point of greatest importance in the management of rheumatic children is the necessity for attention and care during slight ailments. Parents are apt to regard as trivial the pale and tired appearance, the restlessness at night, or the vague aches and pains which are the early evidences of rheumatism in childhood. The necessity for watching for such symptoms and of treating them by a period of rest should be impressed upon the parents, and they should be encouraged to bring the child to be examined every three or four months, in order that no early heart lesion may be allowed to progress undetected. These periodic examinations should be continued up to the age of puberty, and after this time the intervals may be prolonged.

III

MUSCULAR RHEUMATISM AND CHRONIC ARTICULAR RHEUMATISM

By chronic rheumatism we understand an inflammation and hyperplasia of fibrous tissue, especially the fibrous tissue of the muscles, fasciæ, tendons, ligaments, and nerve sheaths, giving rise to pain, and which is caused directly or indirectly by the action of a specific organism, the rheumatic diplococcus.

Chronic rheumatism must be distinguished from the transient attacks of subacute rheumatism, which are frequent in rheumatic subjects, more especially children ; from rheumatoid arthritis, myalgia, and from lesions secondary to traumatism.

Our knowledge of the pathology of chronic muscular rheumatism has been much extended by the work in this country of Garrod, Stockman, and Gowers. Gowers

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attributes the condition to a fibrosis affecting the muscle spindles and fibrous tissue of the muscles and joints, or attacking the sheaths of the nerves, the fasciæ, and tendons. Stockman says that the essential changes are confined to the white fibrous tissue, and that they consist in sero-fibrinous exudation with proliferation of the connective tissue, which may be ultimately absorbed or converted into permanent fibrous swellings and indurations. These fibrous indurations vary in size from a pea to half a walnut, and may be felt in muscle, fascia, nerve sheath, and periosteum. The inflammatory changes in the muscle spindles give rise to painful sensations, especially when the muscles are put in action; and the fibrous indurations, once they are formed, undergo changes in tension and exert pressure on the nerve ends giving rise to pain, when the patient is subjected to certain influences, such as exposure to cold and wet, over-exertion, strain, and dyspepsia.

Although it is possible that chronic rheumatism may be the result of the direct action of the rheumatic diplococcus on the tissues, it is more probable that the changes are brought about by the rheumatic toxin. Bac-

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teriological researches have shown that the diplococcus may assume a quiescent form, and such a form lying latent in the bone marrow, tonsils, fauces, endocardial vegetations, or joints may form a toxin which, under favourable circumstances, is capable of exciting a fibrositis.

Immediately following an attack of rheumatic fever there may result a chronic fibrositis of the capsule and surrounding tissues of joints. In persons, too, who have a long time previously suffered from acute rheumatism the presence of recurring attacks of pain and stiffness in a joint are indications that a like process is in action. The knee-joint and shoulder are those most frequently attacked. No objective signs can be detected, and the chronic articular rheumatism is rather a source of discomfort to the patient than a menace to the general health or to the ultimate usefulness of the joint.

If the joint be enlarged, and especially if there be any indications of thickening of the synovial membrane or lipping of the bones, the case is to be regarded as one of rheumatoid arthritis. Chronic articular rheumatism does not lead to fibrous ankylosis, and if, when a joint is examined, there be found

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firm, fibrous adhesions between the bones, then the probability is that the original lesion was either acute rheumatoid arthritis or gonorrhœal arthritis.

Symptoms.—Complaints of rheumatism in muscles and joints are extremely common in middle-aged persons of the class that frequent the out-patient department of our large hospitals. The pains and stiffness are commonly attributed to changes in the weather, to chill, damp, cold northerly or easterly winds, or over-exertion. A small proportion of cases give a history of preceding attacks of acute rheumatism, and in a still smaller proportion valvular cardiac lesions may be found.

If the joints be affected, no alteration in their appearance is to be noticed, but passive movement may elicit some creaking or crackling. The patient complains that the joint is stiff and painful on movement; there may be a dull aching pain referred to the joint, worse at night or with damp or cold weather, and the pains may shift from one joint to another. It is often very difficult to distinguish such from cases of slight osteoarthritis or from gout. Besnier maintains that with chronic articular rheumatism there may

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be a chronic progressive endocarditis, but it would seem more probable that the condition he describes is one of subacute rheumatism.

The symptoms of muscular rheumatism are more marked and distinctive. The onset of pain may be sudden, and any movement of the muscle greatly aggravates it; the affected muscles are tender, and occasionally in a state of spasmodic attraction. The patient complains of stiffness in the affected regions, or all over the body, and there is a general feeling of tiredness. The period of sharp pain and tenderness in the muscles soon subsides, leaving a dull aching feeling and stiffness, which may last for a long time. The stiffness is most marked on first rising in the morning, or when getting up from a stooping or sitting posture. The acute pain in the muscles not infrequently comes on at night, and is aggravated by heat. The objective signs of muscular rheumatism are the fact that the patients keep the affected parts at rest as much as possible, and the presence in the tissues of fibrous nodules.

To feel the fibrous nodules, Stockman suggests that the skin be first well smeared with liquid paraffin or vaseline, the muscles made

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flaccid, and the painful region examined by firm, gentle pressure with the finger-tips. The nodules are firm, and slightly tender, and are to be found chiefly in the following positions: the fascia lata and tendons of the thighs, the lumbar fascia, the muscles around the shoulder-joint, the pectoral and intercostal muscles, the glutei, and the occipital muscles. Two cases recently under our care showed such nodules standing out prominently in the ilio-tibial band, and in a third they could be felt like small lymphatic glands in the substance of the upper part of the trapezius. The pain leads to limitation of movement and consequent muscular wasting.

Extension of the fibrositis may involve the sheaths of the nerves; thus concurrently with the attack of lumbago there may be sciatica: and following rheumatism in the muscles of the shoulder and upper arm there may be implication of the nerves of the brachial plexus, leading to temporary fixation of the upper limb.

The forms of muscular rheumatism most frequently met with are *lumbago*, chiefly in men of middle age; *pleurodynia*, or *intercostal rheumatism*, increased by respiratory

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movement, coughing, or sneezing; *torticollis*, or stiff neck, commonest in children, and often associated with spasm; *omodynbia*, involving the muscles of the shoulder and back; also rheumatism of the scalp, of the pharyngeal muscles, and of the muscles of the abdominal walls.

A slow progressive fibrous induration of the palmar fascia with contraction of muscles may lead to great deformity of the hand, giving rise to the condition of Dupuytren's contraction. This is well illustrated by the following case:—

S. S., a girl of sixteen years of age, had an attack of rheumatic fever when eight years old. Following this attack there were pains in the palms and fingers of both hands, and these lasted for many months, the fingers gradually becoming flexed. When seen in April 1903 she was suffering from mitral regurgitation. There had been no return of the rheumatic pains for some years, and none of the joints were enlarged. The little finger and the ring finger of the right hand were flexed at the metacarpo-phalangeal and proximal interphalangeal joints and over-extended at the distal joint; and the little, ring, and middle fingers of the left hand were

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hyperextended at the metacarpo-phalangeal and distal interphalangeal joints, and flexed at the proximal interphalangeal joints. Tense cords could be felt in the palm of the hands, and these corresponded to the slips of palmar fascia which are distributed to the affected fingers. The condition suggested rheumatoid arthritis, but there was no muscular wasting of the hands or forearms, no enlargement of the joints or creaking on movement, and the fingers could be straightened out with very little difficulty. Possibly the tendons had suffered with the fascia, and the deformity was due to their contracture. With massage and hot-air baths the patient made a complete recovery. I am indebted to Dr. Newman Neild for the photographs of the case (figs. 4 and 5). This condition has been styled by the French "*rheumatisme fibreux*." In the case just detailed there was no ulnar deviation of the hand, but this is sometimes present.

The constitutional symptoms associated with chronic rheumatism are slight. There is seldom pyrexia, but the patient may complain of a general feeling of tiredness and drowsiness. The tongue is coated, and dyspepsia and constipation may be present.

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The urine is high-coloured, and there is a deposit of urates.

Sufferers from chronic rheumatism are subject to chronic tonsillitis, pharyngitis, rhinitis, and laryngitis.

Serous and plastic iritis is stated to be sometimes of rheumatic origin, and conjunctivitis is an occasional complication.

Treatment.—In the acute stage of muscular rheumatism, when the pain and tenderness are extreme, the administration of salicylate of soda or aspirin, in doses of 15 grains every three or four hours, will in the majority of cases afford relief. / In obstinate cases of pain, antipyrin should be tried, and when the nerves of the brachial, lumbar, or sacral plexus are involved, it may be necessary to give morphia hypodermically.

It should always be remembered that the rheumatic toxin is not the only one capable of exciting these painful affections of the muscles and fibrous tissues, but that gout, trauma, or chill may be the exciting cause ; and in this case the early administration of a combination of alkalies and colchicum, or diaphoretics and diuretics, is most beneficial. In muscular rheumatism a mercurial purge, followed by a seidlitz powder, should be

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given at the outset. The part should be kept at rest in the acute stage, as far as possible. The pain is relieved by warm fomentations covered with glycerine of belladonna ; or mesotan, methyl salicylate, or a combination of the liniments of chloroform and belladonna on lint may be applied.

A Turkish bath, or a vapour bath (and facilities for giving such at home are now available) may be ordered. Simple hot immersion baths are less efficacious.

After a few days gentle massage should be given daily.

The diet throughout should be light.

Chronic muscular rheumatism is little influenced by drugs. Quinine, potassium iodide with bark, alkalies, guaiacum, and sulphur are the most efficacious. *20. 1919.*

Massage is the most important therapeutic agent, and Stockman recommends that fifteen minutes' light rubbing with oil be first employed. This in a few days brings out the fibrous nodules into greater prominence, and deeper massage should then be continued until they are dispersed. The massage should be combined with active and passive movements, and with daily application of the faradic current for five or ten minutes.

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Where skilled massage is not available, daily rubbings with a stimulating liniment, such as the linimentum terebinthinæ aceticum, should be tried morning and evening ; and this may be varied with local counter-irritation by iodine or mustard. Occasional hot immersion baths, Turkish baths, and the change to a watering-place with a course of systematic warm bathing, is also of service in these chronic cases.

The pain and stiffness in joints left after an attack of acute rheumatism, and the arthritic pains recurring in rheumatic subjects are best combated by massage, Aix baths, and the hot-air bath. The pains of true chronic articular rheumatism are not much relieved by salicylates ; and this is a useful point to remember for purposes of diagnosis, for if the condition yield readily to salicylates, then we may conclude that we are dealing not with a chronic fibrositis, but with a sub-acute attack of rheumatism. Alkalies with quinine, guaiacum, colchicum, and sulphur are the most useful remedies in chronic articular rheumatism, and a course of Turkish baths with rubbing should be recommended.

Preventive Treatment.—Sufferers from chronic and muscular rheumatism should

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make every effort to improve the general health and muscle tone by judicious exercise in the open air—walking, riding, and golfing.

The bowels should be regulated by the administration of cascara sagrada, or compound liquorice powder, and occasionally a mercurial pill should be taken. Turkish baths taken systematically may prevent the recurrence of attacks. If the tonsils be large, or the seat of chronic inflammation, they should be removed, and chronic rhinitis or pharyngitis should be corrected. Warm underclothing of wool is important; cold and damp, especially the combination of the two, should be avoided.

As indigestion not unfrequently precipitates an attack, the diet must be carefully regulated. The food should be plain, and the quantity of carbohydrates, sugar, sweets, and potatoes must be limited. The amount of fluid must be in excess of the normal, and should be taken as far as possible on an empty stomach. A tumblerful of hot water before breakfast and on going to bed, and half a tumblerful half-an-hour before two meals in the day should be taken in addition to drinks taken with meals. Ale, cider, and stout are not suitable for patients

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subject to recurrent attacks of muscular or articular rheumatism.

Residence in a dry, warm, inland climate is desirable, with a visit to the Riviera or Egypt during the colder months of the winter and spring.

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IV

ACUTE AND CHRONIC RHEUMATOID ARTHRITIS

SPENDER, in Clifford Allbutt's "System of Medicine," gives the following definition of this disease: "A progressive degeneration of joints of a special kind, accompanied by atrophy of some structures and hypertrophy of others. The course of the disease is variable, but is ordinarily towards irrevocable damage and ruin of the structures involved."

The name rheumatoid arthritis has become so generally adopted by the medical profession, that it would only lead to confusion to adopt any new nomenclature, or to describe the condition under any one of the other names that have been suggested, *e.g.* osteo-arthritis, arthritis deformans, or rheumatic gout. Two varieties of this arthritis may be recognised.

1. *Acute Rheumatoid Arthritis, or Fibro-arthritis*, a polyarticular disease affecting

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essentially the synovial membranes of the joints, but also involving the fibrous and ligamentous tissues, accompanied by various nervous phenomena, occurring chiefly in young adults, and with a tendency to relapses and exacerbations. This is a comparatively rare disease.

2. *Chronic Rheumatoid Arthritis, or Osteoarthritis*, involving the cartilages, synovial membranes, and fibrous tissue of the joints, and accompanied by proliferation of bony tissue, occurring in persons of the middle or more advanced period of life. The disease is extremely common, especially in certain districts.

In our opinion these are two separate and distinct clinical entities, distinguished by well-marked characteristics, viz. the different age period at which they occur, the complete absence of bony proliferation in the one case, and its constant presence in the other; the acute or insidious nature of the onset, and other features which will be mentioned elsewhere.

We have never seen a case of acute rheumatoid arthritis pass into the stage of bony proliferation, and it is our belief that further clinical and bacteriological investigation will

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lead to the conclusion, that under the heading "rheumatoid arthritis" there have been classed at least two, and probably more than two, distinct affections.

The disease which we have here styled *acute rheumatoid arthritis*, corresponds to the acute fusiform disease of Garrod, and the acute polyarticular arthritis of Armstrong and Bannatyne. If this be eventually shown to be a distinct disease, as we believe, it might with advantage be called "fibroarthritis," to distinguish it from what we have here called osteo-arthritis, the crippling form of rheumatoid arthritis of Garrod, and the chronic articular form of Armstrong and Bannatyne.

Predisposing Causes.—Before discussing the etiology and morbid anatomy of these diseases, it is necessary to review briefly the predisposing causes.

Age.—Rheumatoid arthritis is rare in children, but even if we exclude cases of chronic rheumatism, and of a special form of arthritis known as Still's disease, described on page 158, there yet remain on record a number of cases of undoubted rheumatoid arthritis in children under twelve years of age, and these are generally of the acute variety.

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Acute rheumatoid arthritis is especially liable to commence between the ages of puberty and thirty years of age, whilst the chronic bony variety commences principally between the ages of thirty-five and fifty, being especially prone to occur at or about the climacteric. Chronic rheumatoid arthritis may originate quite late in life, after seventy years of age, and a monarticular type of disease, which has been described under the title of *chronic rheumatic arthritis*, is probably an osteo-arthritis modified by the degenerative changes of old age.

Sex.—Both varieties of rheumatoid arthritis are commoner in women than in men, and this is partly to be accounted for by the large number of cases which follow parturition and lactation, and which arise at the climacteric. The proportion of women to men has been variously estimated at from five to ten to one. Boys seem more liable to this disease than do girls.

Heredity.—A history of attacks of rheumatoid arthritis in direct ancestors is in our experience unusual. Sufferers from this disease are, however, very largely drawn from families exhibiting an arthritic diathesis—that is to say, they have an inheritance

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which involves a tendency to inflammation of joints and fibrous structures. Thus a family history of rheumatism or gout is often elicited. The chronic disease is more common amongst the poorer classes, washer-women and agricultural labourers being particularly liable to attack, and amongst this class a correct family history is seldom obtainable.

Climate and Season.—Damp, low-lying, and cold, sunless localities are productive of rheumatoid arthritis, and most sufferers find that their symptoms are exaggerated by cold and damp, and relieved by warmth, sunshine, and a bracing atmosphere. Easterly winds are prejudicial to such persons, and exposure to wet, or catching a “chill,” will often determine the onset of an attack. Rheumatoid arthritis differs from rheumatic fever in that the period of greatest incidence is during the winter and early spring. It is, too, more prevalent in rural than in urban districts.

Previous Illness.—The most striking feature in connection with the predisposing causes of rheumatoid arthritis is the frequency with which it has been found to follow upon some infective disorder, or

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nutritional disturbance. We shall discuss this matter more fully later on, taking the opportunity now of simply enumerating the conditions most commonly observed. Acute and chronic rheumatoid arthritis may be a sequel to an attack of one of the acute infective fevers, such as acute rheumatism, scarlet fever, influenza, dysentery ; or some acute or chronic inflammatory or suppurative lesion ; tonsillitis ; otitis ; ulceration ; bone abscess ; pyorrhœa alveolaris ; oral sepsis ; gonorrhœa ; mucopurulent catarrh ; or erosion of the respiratory, digestive, and genito-urinary passages.

Chronic rheumatoid arthritis is also peculiarly liable to arise at those periods at which the metabolism of the tissues is undergoing marked change such as puberty and the climacteric. Any depressing influences acting directly upon the digestive system or indirectly through the nervous system are also powerful predisposing causes. Amongst such influences the chief are prolonged hard manual labour with imperfect diet, mental anxiety and worry, lactation, and in women the presence of chronic disease of the uterus or ovaries.

Pathological Anatomy.—In both the acute

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and chronic varieties of rheumatoid arthritis there is found a combined condition of inflammation and degeneration which may affect all the tissues in and around the joints.

In the *acute disease* seen in young adults the most marked change is seen in the synovial membrane of the joint. This is found to be thickened, red, and swollen, owing to infiltration with small celled exudation and fibrous tissue. The synovial fringes are thickened and hypertrophied. If there be excess of synovial fluid it will be of a greenish yellow colour, slightly cloudy with flakes of lymph. The cartilage in this type of the disease may present a velvety appearance, but, as a rule, is not proliferated. Opposite the thickened fringes there may be superficial pitting and erosion of the cartilage, and some chronic inflammation of the subjacent bone, but even in cases examined years after the original attack, there are no proliferative changes in bone or cartilage. The ligaments and fasciæ are softened and infiltrated. The tissues lying outside the joint are swollen, and later become fibrosed, adherent, and generally atrophied.

The condition in such a case is essentially

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a chronic inflammation of the synovial membrane extending to tissues immediately outside the joint. It has been stated that when examined with X rays the bones in acute rheumatoid arthritis are more translucent than are normal bones. When comparing skiagrams it should be remembered that much, of course, depends on the penetrative power of the tube employed. Personally we have been able in a few cases to fully confirm this statement (figs. 6 and 7). Should this increased translucency be found constant in acute rheumatoid arthritis, it would prove a valuable point in distinguishing the disease from osteo-arthritis, in which the bones are more opaque.

In the *chronic form* of arthritis the changes are more advanced and varied, being partly inflammatory and partly degenerative.

The synovial membrane is thickened and the fringes hypertrophied. Lying in the fringes there may be found masses of cartilage of variable sizes, or these may become detached and free in the slight excess of synovial fluid. The articular cartilages first present a velvety appearance, but later become fibrillated and eroded, splitting and

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wearing away at points of pressure. Microscopically the change in the cartilage is seen to consist in proliferation of the cartilage cells, and swelling of the cell-spaces, beginning on the surface, and leading to fibrillation of the ground substance. At the edges of the articulation there is a new formation of cartilage in nodular masses, and plates of cartilage may form in the ligaments, or in the capsule of the joint.

The bones where the cartilage has been eroded become hard and eburnated on the surface, and may develop ridges and grooves where in contact with other bones. The deeper layers of bone may show fat drops, and other signs of degeneration, and as absorption takes place, the bone may shorten.

At the edges of the articulation the formation of new bone gives rise to lipping, and the original shape of the articulating surface may be entirely changed ; the socket of the acetabulum, for instance, becoming enlarged and shallow, or the glenoid cavity narrowed and deepened. The capsule may be ossified in plates, and masses of bone develop in the ligaments. True bony ankylosis is exceptional, but is sometimes seen, especially in the spinal joints.

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These hypertrophic changes and the increased density of the bones are well seen in skiagrams, and afford a valuable means of distinguishing between the acute and chronic forms of rheumatoid arthritis (figs. 8 and 9).

The ligaments of the joints are at first thickened, swollen, and shortened ; later they undergo fatty degeneration, and together with the interarticular cartilages they may be entirely absorbed and replaced by connective tissue. Strands of connective tissue may form adhesions inside and outside the joint.

In addition to these changes the cellular tissue in proximity to the joints is thickened and matted, the neighbouring tendons stretched and thinned, and bursæ in relation to the joints are found with thickened sac walls, and containing an excess of fluid in which there may be free bodies floating.

Certain changes are found in both forms of the disease. Lymphatic glands near the affected joints may be enlarged from chronic hyperplasia, and these are especially found in the groin and axilla.

The muscles undergo atrophy, but the fibres are not affected uniformly even in the same muscle.

In some cases peripheral neuritis has been

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detected, but this is exceptional. Similarly the changes described in the spinal cord—wasting, degeneration, and vacuolation of the ganglion cells in the anterior cornua—are not constant.

Pericarditis and adherent pericardium have been noted in a few cases, especially in children, and endocarditis is occasionally present.

Fibrous nodules lying in the skin or subcutaneous tissue resemble in appearance and histological structure those found in acute rheumatism.

Pathogenesis.—The two theories with regard to the causation of rheumatoid arthritis which hold the field to-day are those which attribute it either to a nervous or to an infective origin.

Ord and Spender, who have been the chief supporters of the nervous theory, believe that the changes in the joints are secondary to reflex nervous disturbance in the spinal cord. Disease of the uterus, ovaries, or other organs acts upon a cord unduly irritable owing to debility and anæmia, and the changes thus excited in the cord influence reflexly the nutrition and health of the joints. The objections to such

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a theory are that if the disease were purely nervous in origin we should expect several, if not all the joints, to be attacked at one time. The joint lesions which occur in certain nervous diseases—tabes, ataxic paraplegia, chronic poliomyelitis, and neuritis—differ from those of rheumatoid arthritis; inasmuch as they are usually painless, are accompanied by much synovial effusion, do not limit the movement of the joint, and are accompanied by objective nervous phenomena. The nervous diseases which are associated with joint lesions are all represented by gross lesions of the cord; but with the exception of a few doubtful cases no such changes have been demonstrated in rheumatoid arthritis. It would be contrary to our experience to expect advanced joint changes as a result of reflex action or functional disturbance, even if prolonged over a period of many years.

Llewellyn Jones attributes the disease to a toxæmia which acts upon one or more segments of the spinal cord, and thus gives rise to correlated groups of symptoms.

Others, amongst whom we may mention Bannatyne, Schüller, Chauffard, and Ramond, have attributed the disease to a

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bacterial infection, but are not agreed as to the specific nature of the organism.

The bacteriological results up to the present may be summarised as follows:— Bannatyne described a bacillus which was very resistant to ordinary staining methods, and had a characteristic growth in broth. A similar organism was found by Chauffard and Ramond. This bacillus was detected in fluid taken from the joints. Inoculation experiments gave a negative result. Schüller described a bacillus very similar to the foregoing, but its staining reaction and cultural characteristics were distinctive. He found associated with the bacillus a coccus, and in this respect his investigations resemble those of Hale White, who in a case of acute rheumatoid arthritis obtained a culture of a diplococcus from the knee-joint, and a diplo-bacillus from an enlarged mesenteric gland. Neither of these were pathogenic to animals, but Schüller states that his bacillus when introduced into the joints of animals excited lesions resembling those of rheumatoid arthritis.

Successful inoculation results have also been claimed by Von Dungern and Schneider, who isolated from rheumatoid joints a diplo-

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coccus resembling the diplococcus rheumaticus. This is of especial interest in view of the fact that Poynton and Paine have isolated from a rheumatoid joint a diplococcus which they regard as indistinguishable from the diplococcus rheumaticus, and which when inoculated into rabbits was able to excite lesions which might not only resemble those of rheumatoid arthritis but occasionally also those of acute rheumatism. Gask has reported a case of acute rheumatoid arthritis in which a diplo-streptococcus was cultivated from the fluid from the knee-joint, but he expressly states that the organism was in his opinion the streptococcus pyogenes. My own investigations into the bacteriology of this disease have led me to the conclusion that in the majority of cases no micro-organisms can be detected either in the blood or in the fluid from the joints. In three cases only have my results been positive. From one of these, a case of acute rheumatoid arthritis examined in December 1897, there was obtained from fluid drawn off from the knee-joint a diplococcus apparently identical with the diplococcus rheumaticus since described by Poynton and Paine; and from the other two, both cases

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of osteo-arthritis, a *staphylococcus albus* was cultivated in the one case from the knee and in the other from a finger joint. *Staphylococcus albus* is so frequently an accidental contamination of cultures that one hesitates to attach much importance to these last results, but it is noteworthy that in both cases the disease had apparently originated from a chronic septic wound, namely, a varicose ulcer of the leg, and a chronic ulcer of the forearm.

It is probable that in this disease, as in acute rheumatism, the invading organism lies in the tissues rather than in the exudation into the joint, and thus cultures from aspirated joint fluid are seldom successful. From the foregoing it is clear that there is not sufficient evidence that rheumatoid arthritis is due to an infection by a specific organism, although it is certain that the joint fluids may contain germs which, from the disappointing results yielded by inoculation experiments, are probably of low virulence. As post-mortem examinations upon cases of rheumatoid arthritis are rare, few opportunities of microscopical and bacteriological examination of joint tissues have occurred.

The three most prominent features in

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connection with the causation of this disease are the inheritance of an arthritic diathesis; a condition of malnutrition and debility; and the presence of a toxic focus. We venture to suggest that the way in which the disease arises is as follows:— In the acute cases the disease is generally due to a microbic infection in which the bacteria enter the joints, elaborate toxins, and lead to the low inflammatory changes. In chronic rheumatoid arthritis (osteoarthritis) the organisms are confined to some local lesion, and the joint disease is secondary to the poisons which they elaborate. This may be illustrated by the history of three acute cases which have been under our care. The first case dated her attack from the formation of a large varicose ulcer of the leg, the nearest joint, the left knee-joint, being first attacked, and staphylococci were demonstrated in the joint fluid. The second case of subacute severity had as the primary focus an antral abscess. The third was a sufferer from chronic follicular tonsillitis. All three had a distinct and pronounced arthritic family history. The primary septic focus is not always easy to find, and indeed may not at

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the time of examination be present. The infective agent may be introduced during an attack of one of the acute infective fevers, including rheumatism, or may be derived from suppuration in the aural and nasal cavities, diseases of the tonsils, suppuration or decomposition around defective teeth, or beneath a dental plate, ulceration of the stomach, or duodenum, catarrhal affections of the intestines, fistula in ano, and haemorrhoids. Phthisis and chronic inflammatory conditions of the lungs, diseases of skin or bone, traumatic lesions, and catarrhal conditions of the genito-urinary tract, including latent gonorrhœa in both men and women, are often also the original source of the infective material.

In many cases of chronic rheumatoid arthritis it is impossible to demonstrate a septic focus, and in these the joint changes are in our opinion due to toxic changes in the blood, brought about by profound alterations in the processes of assimilation and nutrition. We are of course familiar with arthritic changes brought about by chemical excitants in the case of gout, and in the arthritis following the injection of antitoxin. In rheumatoid arthritis the malnutrition and

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improper assimilation of food can often be traced to a definite source, such as defective mastication due to imperfect teeth, dilatation of stomach, dyspepsia due to improper food, to worry, overwork, or chlorosis. It seems probable, too, that the blood changes which accompany the puerperal period and the climacteric may have a similar effect, and this would account for the numerous cases of rheumatoid arthritis seen at these periods of life.

In many cases two or more of these causes may be at work ; for instance, in the washer-women, housewives, and agricultural labourers who so frequently suffer from this disease, it would be difficult to decide whether the onset of the disease was determined by any one of the numerous illnesses from which they have frequently suffered, or by the malnutrition consequent upon years of overwork, defective feeding, or dental insufficiency.

Whatever be the nature or source of the toxin, its effects are not limited to the joints, but may be seen in most of the other systems, and most pronouncedly in the nervous system.

As in gout, this intoxication is a general

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one, but the obvious and painful nature of the symptoms in the joints may mask other symptoms not less important.

Symptoms.—Before considering in detail the several symptoms of rheumatoid arthritis, it may be well to briefly outline the progress of the disease as seen in two fairly typical cases.

Case 1. Acute Rheumatoid Arthritis.—S. M., a married woman aged thirty years, first came under treatment for pains and stiffness in the joints on February 8, 1904. Her mother had suffered from “chronic rheumatism” for years. Patient was in the Bristol Royal Infirmary when eight years old, suffering from rheumatism, and has had two attacks since; on one occasion she was in bed for seven weeks. She had chorea in her first pregnancy, and to a lesser degree in five subsequent pregnancies. She has suckled each one of her children for twelve months. She is subject to repeated attacks of sore throat, and gets pain and swelling in the hands and feet after working at the wash-tub.

The present attack followed the birth of her sixth child. The labour was normal, and not followed by any septic fever. The pain

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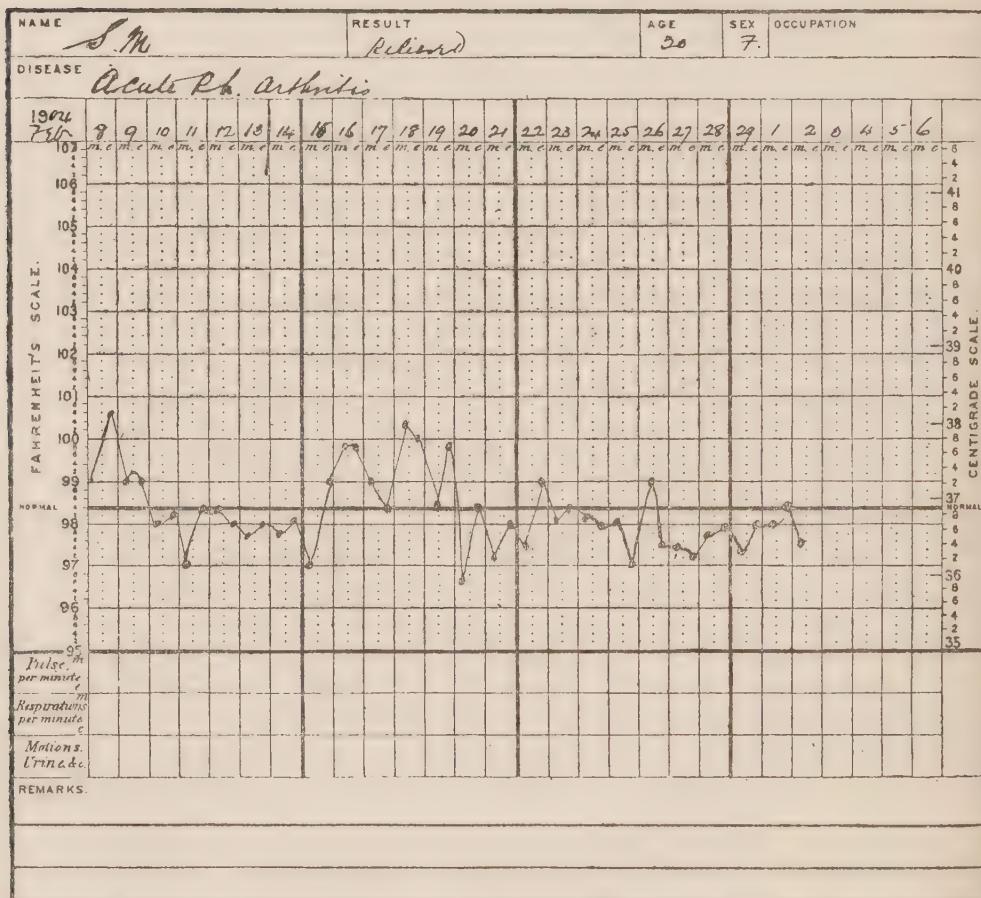
and swelling commenced in the hands and fingers whilst she was still in bed, and extended to the neck, and to the ankles and knees. It was regarded as an attack of rheumatic fever.

On admission, six weeks after her confinement, the joints affected were the metacarpo-phalangeal joint of the left thumb, together with the proximal interphalangeal joints of the first, second, and third fingers of the same hand. In the right hand all the metacarpo-phalangeal joints were affected, and also many of the interphalangeal. The swelling of the fingers was spindle-shaped, and the fingers were stiff and painful on movement. The left wrist was stiff, swollen, and unshapely. Both knee-joints were thickened, and the right contained excess of fluid.

The joints were exquisitely tender, but the skin over them was not reddened. There was marked wasting of the dorsal interossei muscles of both hands, and the skin of the arms as high as the axillæ was covered with patches of pigment resembling freckles. Similar freckling was present over both knees. The skin of the feet and of the palms of the hands sweated profusely and

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was cold. There was pain running up the arms, and stiffness in the ankles, elbows, and shoulders. The heart was dilated, and there



Temperature Chart.

was an apical systolic murmur present, which persisted throughout the illness. Pulse, 88; temperature, 99°. The digestion was impaired, and every tooth, with the exception of the incisors and canines, was carious.

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For the first month of the patient's stay in the hospital little improvement was noted. There were repeated recurring attacks of pain and swelling in various joints, and accompanying these were fresh crops of freckles. The pulse rate rose to 104, and the feebleness and cachexia increased. The pains and the joint swelling were not relieved by salicylate of soda. During the second month a marked improvement was evident, and under the influence of a largely increased nitrogenous diet, cod liver oil and tonics, together with light massage and electrical baths, the acute symptoms subsided, and the patient was discharged with the joints so far recovered as to permit her undertaking light domestic duties. The carious teeth had been extracted during her stay in hospital, and every effort made to overcome the oral sepsis. The patient was seen three months after her discharge from hospital, having attended during this period for electrical baths. Some swelling in the fingers and general stiffness in the joints persisted, but a skiagram taken of this hand showed no bony changes (fig. 9).

Case 2. Chronic Rheumatoid Arthritis (osteo-arthritis).—A. B., a widow aged sixty-one,

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was admitted to the Bristol General Hospital on March 15, suffering from "chronic rheumatism." She was a hard-worked woman, and had had fifteen children ; these she had suckled, some for twelve or fifteen months. At the age of twenty-five she had scarlet-fever and smallpox. No history of rheumatism. Climacteric at forty-five years of age.

Two years previous to her admission she developed an ulcer on the front and outer side of the left leg. This lasted for twelve months, and just before it entirely healed up she noticed a sharp pain in the left knee, which was not red or swollen, but which "cracked" on movement. The pain and stiffness then gradually spread to other joints, involving next the left wrist and elbow, then the fingers of both hands, and the right wrist. The pains were made worse by cold, but were not aggravated at night. Six months before admission she noticed that all the joints were getting much larger, and they increased rapidly in size during the last two months.

The patient was a well-nourished woman, with a deep red complexion, and dark red cyanosed hands. The colour of the hands

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and face was subject to marked variations, and she stated that after washing, or bathing, or any cold, "the hands go black." The heart and lungs were normal. Pulse, 84; temperature, 99°. The tongue was clean, the bowels constipated. No complaint of dyspepsia. All the lower molars were absent, and the upper molars represented by a few stumps. There was profuse sweating of the hands and feet, and impaired sensation to pain in the palms of both hands. No pigmentation of skin. Both knee-joints were swollen, but the skin over them was not red or hot. The knee-joints contained excess of synovial fluid; there was bony lipping of the upper ends of the tibiæ and lower ends of the femora; the patellæ faced outwards. The joints were tender, not easily moved, and creaked. A drachm of fluid was drawn off from the left knee. It was slightly opaque, and of a yellowish green colour. Microscopical examination showed leucocytes and lymphocytes. Both wrist-joints were stiff and much swollen, and the carpo-metacarpal joints of both thumbs were ankylosed by long bony outgrowths. The interphalangeal joints showed bony lipping, and Heberden's nodes were present. There

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was ulnar deviation of the hands. The left elbow and shoulder joints were painful, and there was pain on pressure over the musculo-spiral nerve.

A skiagram of the hand showed increased density of the bones of the phalanges, and osseous hypertrophy and thickening of the structures surrounding the joints.

A blood examination showed, Hg. 84 per cent.; red cells, 4,350,000; white cells, 18,187.

The patient was treated with guaiacol carbonate and arsenic internally, and a liberal diet given. After a few days' rest in bed, warm electrical immersion-baths were administered daily, followed by gentle massage and passive movements. Later, hot-air baths were given alternately to the wrists and knees, and these afforded considerable relief.

After a stay of many weeks, the patient was discharged. The left elbow and shoulder were still very painful, especially after exposure to cold. The knees had much improved, and the patient could walk better. The hands and wrists were unaltered.

Mode of Onset.—The methods of invasion in acute and chronic rheumatoid arthritis are

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very varied, and in the early stages it is impossible to distinguish between the fibrous and the osseous forms. As it is in the early stages of the disease only that we can hope for success in treatment, it is very important that the premonitory and preliminary signs should be recognised. In a few cases the onset is that of an attack of true rheumatic fever, and indeed it has seemed to us that the first illness may be acute rheumatism, which, owing to some modification of the virus, or to some peculiarity in the constitution of the sufferer, is so modified that the resulting condition is that of rheumatoid arthritis. Such cases have in our experience been of the acute variety, and are often very intractable. This does not imply any direct relationship between the two diseases in all cases, but indicates that the *diplococcus rheumaticus* may be the exciting toxic agent in exactly the same manner as many other micro-organisms.

More commonly the onset is gradual, the patient complaining of pains in one or more joints, especially at night, or of a burning, uncomfortable sensation in the arms, which are on this account thrown outside the bedclothes. Cramps in the muscles occur-

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ring at night-time are also common. Such symptoms are less frequent during the day, but the joints may feel a little stiff in the morning. This stiffness of joints in the morning, especially if accompanied by creaking of the joints, or by neuralgia, should always lead to a suspicion of rheumatoid arthritis, and the symptoms are particularly liable to be complained of after a day of unusual physical exertion.

The early symptoms are sometimes those of muscular rheumatism, stiff neck, pain across the back, or of neuralgic pains running up the forearms, or down the back of the thigh.

Very frequently the initial joint symptoms are attributed to some slight accident, such as a sprain of the wrist, ankle, or thumb; and it is only the persistence of the symptoms or the appearance of the signs of the disease elsewhere that enables the true diagnosis to be made.

A feeling of weakness in the muscles and fatigue after slight exertion may be a premonition of the onset, and disturbances of the sensory nervous system, such as tingling, feeling of pins and needles, or of burning or flushing or chilliness, is often complained of. Attacks closely resembling Raynaud's

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disease, and accompanied by sweating in the face, hands, or feet occur early in the course, as also in the later period of rheumatoid arthritis.

Joints.—The joints most frequently attacked are those on which the maximum amount of strain is put—namely, the small joints of the fingers, the metacarpo-phalangeal, and the wrist-joints, the knees, and ankles. There is a tendency for the disease to start in the peripheral joints, and spread to those nearer the trunk, first invading the upper and then the lower limbs, the lesions ultimately becoming symmetrical. Occasionally identical joints in the two limbs are attacked simultaneously; thus in a case recently under our care the two knee-joints were first attacked simultaneously, then the interphalangeal joints of both hands, and finally both wrists.

Certain joints not usually affected by other forms of arthritis, are peculiarly liable to rheumatoid infection. Thus the temporo-maxillary articulation is often attacked, and the resulting ankylosis may be so firm as to lead to considerable difficulty in feeding. In the acute disease the intervertebral joints, especially those of the cervical spine, may be

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involved, and the resulting early stiffness in the neck is apt to be mistaken for muscular rheumatism. The spinal arthritis is progressive, and leads to atrophy of the ligaments, cartilages, and intervertebral discs, with ultimate ankylosis and permanent spinal rigidity and deformity.

In *the acute fibrous variety* of rheumatoid arthritis the joint symptoms may be of all degrees of severity. In the early stages, although the patient may complain of constant pain and stiffness in the joints, there may be no objective symptoms, and the diagnosis must then depend upon the recognition of the allied nervous phenomena, the presence of pigmentation and of vascular disturbance. The pains in the joints are generally worse at night, and may be of an aching, gnawing, or darting character. They are generally worse in cold and wet weather, and do not appear to be strictly localised to the joints. Tenderness over the joints is constant, and the patient complains of a sense of rigidity and stiffness in them before any limitation of movement can be detected. Sufferers from rheumatoid arthritis frequently complain that the joints creak, or crack with movements, and if the observer place the

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hand firmly over one, such as the knee-joint, the sensation of creaking can be felt.

In an arthritic lesion of the acute rheumatoid variety a slow progressive swelling appears, often commencing in the metacarpo-phalangeal joints of the index and middle fingers. The skin over the joint has a dusky red tint, and later may present a shiny appearance. In the larger joints, especially the knee, excess of fluid may be evident, and this gives a tense elastic feeling. In the cases in which there is apparently no excess of fluid the joints feel doughy from thickening of the capsule of the joints, and matting of the surrounding tissues. Any attempt to move the joint is resisted on account of the pain which is caused, and in the later stages movement is limited by periarthritic adhesions, which give rise to crackling, and which may be so dense as to lead to an erroneous diagnosis of bony ankylosis.

When the proximal interphalangeal joints are attacked they frequently give to the finger a characteristic spindle shape, and the contraction of wasted muscles and of surrounding fibrous tissue leads to deformities of which we shall speak later.

It is always necessary when there is much

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thickening around a joint to have a skiagram taken, in order to determine whether there be bony proliferation or not, and whether the bones show increased or diminished density of structure. Dense fibrous adhesions are sometimes seen to follow acute rheumatoid arthritis in which there has been little or no exudation into the joint. This tendency to form fibrous adhesions is a characteristic which very clearly marks off the acute from the chronic disease.

In *chronic rheumatoid arthritis* the early joint symptoms are similar to those just described, and it is stated that they may be directly consequent upon an attack of the acute disease, although this is contrary to our experience. The onset of the symptoms is less acute, and is not accompanied by much fever; the disease does not spread so rapidly from joint to joint, and the skin over the joints is not hot and reddened. Trophic changes in the skin, and nervous and vasomotor symptoms are far less common in chronic cases, which are characterised peculiarly by constant gnawing pain and progressive stiffness and deformity of joints. Spindling of the fingers is not common in chronic rheumatoid arthritis, but outgrowths of bone or cartilage

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at the joints may cause the most extreme distortion, so that ultimately the hand may become shapeless and hopelessly crippled (figs. 10, 12, 13). The phalanges may be flexed or extended upon one another or upon the metacarpal bones, and dislocations partial or complete may exist (fig. 14). The fingers are generally deflected towards the ulnar side of the hand (fig. 17), but the distal joints may show a radial deflection. The ankle joint is often fixed, the foot adducted and resting on the outer border. The great toe overlaps the smaller toes.

Distortion of the joints is in part due to the osteophytic outgrowths, and in part to impairment of the ligaments, to the wasting of some muscles which act upon the joint, and the increased tonicity of others, and to erosion of the heads of the bones. The lipping at the edges of the joints, and the osteophytic outgrowths can be distinctly felt, and in the larger joints (such as the knees) foreign bodies can sometimes be detected in the synovial fluid. The fluid is only occasionally excessive in amount, and from some joints we have drawn off material like thin transparent jelly. The ends of the bones forming part of the distal joint of the fingers are often

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thickened, giving rise to a condition known as Heberden's nodes (fig. 14). These nodes are held by some to be indicative of gout, but such has not been our experience. They are chiefly seen in slight cases of the disease in women.

Tendons near the joints are thinned and stretched out, and the muscles wasted. This wasting of the muscles is in part responsible for the increasing immobility of the joints, but the chief cause is the limitation of movement enforced by the presence of osteophytic outgrowths which may meet and fuse so completely as to establish an absolute ankylosis. The thickening of the fibrous structures in and about the articulation also contributes to this fixation. Ultimately there may result a fixation of numerous joints, so that the sufferer is hopelessly crippled, and cannot feed or dress himself without assistance. The erosion of cartilage which is taking place within the articulation leads the patient to place the joint in the position of greatest ease; the elbows and knees are flexed (fig. 15), the forearm pronated, and the shoulders and spine held rigid, and any attempt to alter these positions is resisted on account of the pain

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which is caused by the movement. When a joint is moved, creaking, crackling, or grating may be both felt and heard.

Bursæ in connection with the joints are enlarged and distended with fluid. They are found chiefly over the olecranon, beneath the hamstrings, or over the back of the wrists. Ganglionic swellings of the tendon sheaths of the wrist are common.

In some cases the brunt of the disease seems to be borne by the vertebral joints (spondylitis), which may become ankylosed. In such the diagnosis in the absence of the usual articular signs and symptoms is often obscure, and must depend upon the rigidity of the trunk, the radiating pains, and the atrophy of muscles. The cervical vertebræ are those most frequently affected, and the head may be flexed upon the chest, or very much restricted in its range of movement, every attempt giving rise to pain, grating, or crepitation. Spondylitis occurs most frequently in acute rheumatoid arthritis, and, contrary to the general rule in this form of the disease, a bony ankylosis may result.

Nervous System.—Rheumatoid arthritis is not infrequently found associated with diseases of undoubtedly nervous character,

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such as Raynaud's disease, migraine, exophthalmic goitre, and asthma. We have recently had under our care two patients suffering from chronic rheumatoid arthritis, in whom well-marked asphyxial attacks of the hands, feet, and face were noticed. The vasomotor changes in this disease are well known, and will be described elsewhere. Exophthalmic goitre most frequently precedes the rheumatoid infection ; asthma may run concurrently with it. One patient stated that her asthma was better when the arthritis was worse, and *vice versa*. The knee-jerks in rheumatoid arthritis, especially in the acute stage of the disease, are exaggerated, and the deep reflexes generally are increased, more particularly in the neighbourhood of the affected joints. The exaggeration of superficial reflexes is not so marked, and they may be found sluggish. Ankle-clonus is found in acute cases. The reflexes return to normal as the case improves. Abolition of reflex when observed is due to extreme wasting of the muscles or to neuritis. Such neuritis is not common ; it gives rise to the usual symptoms, pain, tenderness, and muscular wasting. It is caused either directly by the toxin which

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excites the disease, or is secondary to the inflammatory disease in the joints. The neuritis accounts only for some of the pain experienced in this disease, much of which is due to neuralgia. Neuralgia of any branch of the fifth nerve may accompany disease of the temporo-maxillary articulation, and pains in the front or back of the thigh are frequently complained of, more especially perhaps when the hip-joint is attacked. Shooting pains in the forearms or hands are very distressing, and there is often a dull aching in a limb, the site of which cannot be accurately localised, and which is worse at night. Perhaps the most constant pain of all in rheumatoid arthritis is that starting from the back of the neck and radiating up to the vertex of the occiput, and possibly this and the lumbago and sciatica are in many cases dependent upon inflammatory lesions in the spinal column extending to or pressing on the nerve trunks. Reference has already been made to the subjective symptoms of rheumatoid arthritis, sensations of tingling, pins and needles, numbness, burning or cold. These, together with the alteration of the reflexes, the neuralgia, neuritis, and vasomotor dis-

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turbances, show how heavy is the incidence of the toxin upon the nervous system; but whether it acts upon the cord as a whole or upon certain segments, or whether the result be a disturbance of the functional activity or some gross pathological lesion, we are not in a position definitely to state.

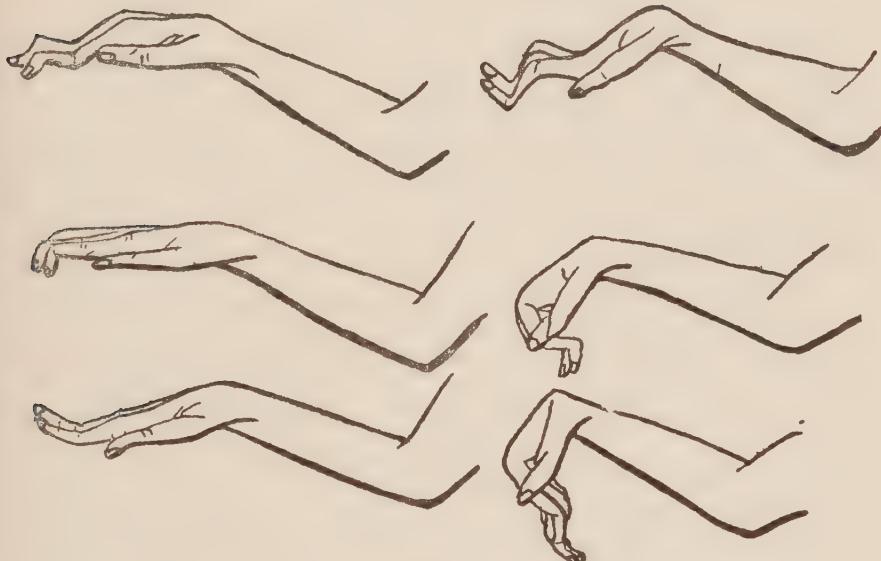
Muscles.—The earliest signs of implication of the muscles may be cramps occurring chiefly at night-time, or slight failure in motor power. The patient may complain of being tired after very slight muscular exertion, or state that she is liable to drop articles. In doubtful cases it is sometimes useful to test the hand-grip by means of a dynamometer, there being a marked loss of power on the affected side. A record of the hand-grip should be taken from time to time as the case progresses, as it affords a useful index to the progress of the disease. Wasting of the muscles may precede the appearance of the arthritic symptoms, but the reverse is usually the case. The muscles most affected are the dorsal interossei in the hand (fig. 16), the muscles of the thumb and little finger, and the muscles of the thigh when the knee-joint is enlarged.

The extensors are more affected than the

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flexors. The electric excitability of the muscles is not altered ; there is no reaction of degeneration, if we except those rare cases in which neuritis is present.

The wasting of the muscles is accompanied by spasm and contraction, which lead to mal-position of the joints. Thus the elbows and



Chronic Rheumatoid Arthritis. Types of hand deformity (Charcot).

knees are kept flexed, the metacarpo-phalangeal and the terminal phalangeal joints are flexed, and the proximal interphalangeal joints over-extended ; or this order may be reversed (fig. 15). The whole hand deviates towards the ulnar side. As the case progresses these positions become permanent, and cannot be corrected by passive movements.

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Spasm occurs in muscles which show no sign of wasting. Thus the upper part of the trapezius may be affected, giving rise to a torticollis which may last for days; or the sterno-mastoid, or muscles of the back or shoulder-joint, may suffer in the same way. Cramp we have already referred to as a common symptom, and tremor of a limb and fibrillary twitching of muscle fibres are seen occasionally in rheumatoid arthritis.

Symptoms resembling bulbar paralysis, loss of power in the respiratory muscles, with difficulty in deglutition and impairment of speech, have been described as occurring in this disease, but it is probable that this is an accidental association of diseases.

The changes brought about in the muscles in rheumatoid arthritis are probably mainly myelopathic in origin. The fixation and degeneration of the joints will only in part account for the muscular atrophy; and peripheral nerve changes, when present, will also contribute.

Cutaneous Changes.—Trophic changes, disturbance in the chromatogenous function, and vasomotor disturbances of the skin, are amongst the symptoms of rheumatoid arthritis, and are best seen in the acute variety of the disease.

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Flushings, and sensations of heat and cold, coldness of the hands and feet, are frequently met with, and if the extremities be felt they will be found cold and clammy, in many cases bedewed with a profuse cold sweat. Sweating is seen in some cases over the upper part of the trunk. The skin around affected joints and on and over wasted muscles may be shiny, smooth, and hairless; it may be whiter and more transparent than the normal, or exhibit a pinkish gloss. The nails of the fingers are thin, longitudinally ridged, and brittle. Patches of leucodermia are sometimes present in the neck and arms, also areas of considerable thickening of the skin.

One of the most constant and diagnostic evidences of rheumatoid arthritis is the presence of abnormal pigment in the skin. In all cases of arthritis of doubtful type, pigmentary changes in the skin should be sought for, and their presence is strong presumptive evidence of the rheumatoid nature of the disease. Dark, brownish-black streaks of pigment, like smudges of silver nitrate staining, are seen over the temporal fossæ, beneath the lower eyelid, and around the neck. In colour they resemble the

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small patches of pigment, like moles, which may be scattered on the hands and face. A lighter bronze pigmentation is found on the forehead. It resembles chloasma, and similar pigmentation is found over the backs of the hands. In a chronic case recently under our care, the whole complexion was darkened, giving the patient the appearance of a mulatto, and the pigment was equally dense over the whole body. Freckling, the deposit of light yellow pigment in round spots, is found chiefly on the forearms, and more sparsely on the upper arms. It may be seen on the forehead at the root of the hair, and over the knees and lower parts of the thighs, if the knee-joints be affected.

Another pigmentary change that has been described is the formation of a circle of yellow coloration around the finger-joints, toes, and nails. Dr. Spender described the coming and going of small areas like bruises, which pass through the same sequence of colours as a bruise.

The freckles may disappear as the case improves, and exacerbations of the disease may be marked by the appearance of fresh crops of spots.

Psoriasis may accompany rheumatoid

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arthritis, and in one case of osteo-arthritis under our care the appearance of the rash on the elbows and knees coincided with the onset of the bony changes. We have also seen in this disease a form of eczema appearing periodically on the dorsal surfaces of the hands. The hair may fall out so as to threaten baldness, and this is most marked just above the forehead and temples.

Fibrous nodes resembling those seen in acute rheumatism, and lying in the subcutaneous and periosteal planes, are commonest in acute cases, and are found most frequently in the forearms and thighs. They are of interest as showing the relationship which may exist between the two diseases, for they are generally found in cases originating from rheumatic fever. The fibrous nodules may persist for months, and they have not such a grave prognostic value as when seen in acute rheumatism.

Circulatory System.—In many acute and chronic cases the pulse is quickened, remaining between 90 and 100 during the whole course of the illness. In others the pulse rate remains normal, and in our opinion an exaggerated importance has been attached to the increase of pulse rate as a diagnostic

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sign. Increased pulse tension is chiefly noted in the chronic bony cases, and is incidental to the period of life of many of the patients.

The occurrence of endocarditis is certainly commoner amongst persons suffering from rheumatoid arthritis than amongst sufferers from other diseases, but as the rheumatic diplococcus is an exciting cause of the disease, this fact is readily explained. A primary attack of acute rheumatism we may suppose leaves an endocarditis, and the secondary effect of the organism is seen in a subsequent attack of rheumatoid arthritis.

Pericarditis is stated to occur more particularly in children, and the appearance of this symptom is probably chiefly in cases of rheumatic origin.

The blood is very little modified, the red corpuscles and hæmoglobin normal or slightly reduced, with slight increase of the polymorpho-nuclear leucocytes.

An average of our own cases shows, in acute rheumatoid disease: Red blood cells, 5,700,000; white, 8000 per cubic millimetre; hæmoglobin, 75 per cent. In the osteo-arthritic type: Red blood cells, 4,320,000; white, 12,200; hæmoglobin, 75 per cent. The highest leucocyte count was 13,000

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per cubic millimetre in an acute case. The absence of leucocytosis may perhaps be accounted for by the fact that very few acute cases were examined, and these only at long periods after their commencement. We have never been able to detect micro-organisms in the blood.

The *urine* is of low specific gravity. There is a diminution in the amounts of urea, uric acid, and phosphates excreted, and in acute rheumatoid arthritis a large excess of calcium salts. The reaction is faintly acid or neutral, and there is no albumen. In cases with dyspepsia, the urine may contain indican, skatol, and excess of organic acids.

Temperature.—At the commencement of acute cases, the temperature rises to 100° or 101° F. at irregular intervals (see Chart, page 130), and may continue to show such rises for weeks. Later, however, even though the symptoms be severe, the temperature remains sub-normal. There may be slight pyrexia in the early stages of osteo-arthritis.

Digestive System.—We cannot emphasise too strongly the necessity of recognising that lesions of the digestive tract, and dyspepsia, are more commonly primary exciting causes of the disease than they are symptoms secon-

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dary to its incidence. Recent work on pernicious anaemia has shown how oral sepsis may give rise to a general toxæmia, and in every case of rheumatoid arthritis of doubtful origin the teeth should be examined. Very frequently they will be found carious, and many of our chronic cases have been completely edentulous. In the one case the septic organisms are passed on to the stomach and bowels, where they excite putrefaction, or directly enter the system; and in the other, the absence of teeth leads to the swallowing of imperfectly masticated food unmixed with saliva, which undergoes fermentation and excites dyspepsia. This flatulent dyspepsia is exceedingly common with osteo-arthritis, as also is constipation, and it is noteworthy that many of the drugs most extensively used for the cure of this disease are intestinal antiseptics.

Bonchard states that he found dilated stomach in 27 per cent. of all cases of osteo-arthritis, but we have not found this condition at all frequent. The association is interesting on account of the connection which has been shown to exist between dilated stomach and tetany, a disease generally acknowledged to be due to the

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action of a digestive toxin on the nervous system.

Special Senses.—Suppurative and chronic inflammatory conditions of the nose, throat, and ear are not infrequent starting-points of rheumatoid disease. An instructive case was that of a youth of nineteen years of age, who complained of rheumatism in the hands of twelve months' duration. There was spindling of the fingers, and some stiffness and pain in other joints. He also complained of material like sand coming down from the nostrils. Examination showed that the posterior wall of the pharynx and the nasal cavities were covered with dry greenish crusts, the condition being one of rhinitis and pharyngitis sicca. Treatment directed to the cure of this condition resulted in complete relief of the pains, and the fingers were much benefitted by baths. Some months later, with a return of the pharyngitis, all the symptoms in the joints returned.

Deafness is sometimes found apart from any inflammatory ear disease, and is presumably due to ankylosis of the ossicles. Similarly fixation of one or both arytenoids may lead to impairment of the voice.

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Conjunctivitis and iritis may complicate osteo-arthritis, the former being the more common. Contraction of the visual fields is present, and is probably of vasomotor origin, it being more marked in those cases

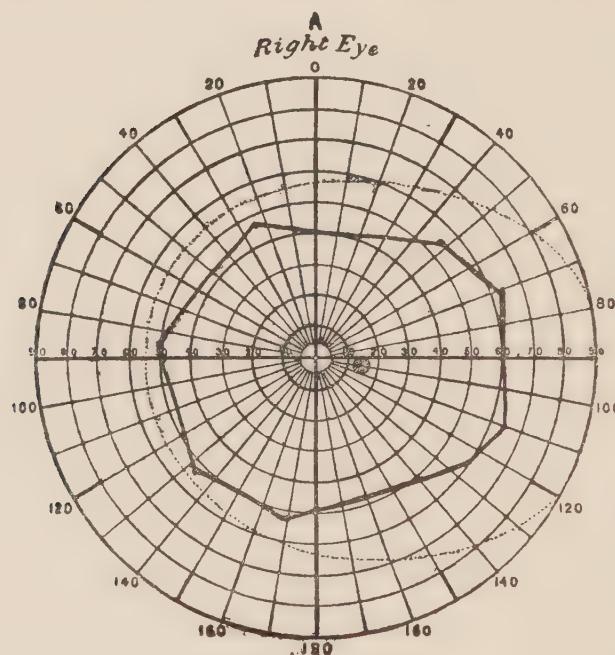


Chart showing contraction of visual fields in case of acute rheumatoid arthritis.

which show symptoms of local syncope or asphyxia.

Other ocular phenomena which have been described in association with this disease are ptosis, diminution of pupil light reflex, transient obscurations of vision, and optic atrophy; but all these are rare.

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RHEUMATOID ARTHRITIS IN CHILDREN

Rheumatoid arthritis in children is rare. We have seen two cases; in one, a boy of twelve, the disease followed an attack of rheumatic fever, and resulted in some spindling of

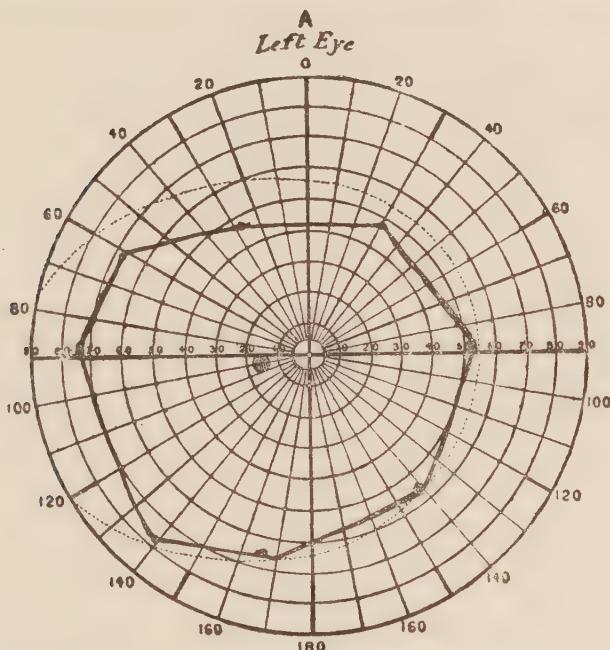


Chart showing contraction of visual fields in case of acute rheumatoid arthritis.

the fingers, and fixation of the spine in the cervical region. In the second case—a girl, aged nine—the disease had been in existence for several years (fig. 18). The symptoms in children differ in no way from those found in adults—there being the swelling and deformity of the articulations, ankylosis of

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the jaw or other joints, wasting of the muscles, and pigmentation of the skin. It commences commonly about the sixth or seventh year of life, and such cases as we have seen have been of the acute variety.

A disease in children closely resembling rheumatoid arthritis, and possibly being a modified form of the disease, has been described in this country by Still and in America by Royal Whitman. A brief description of the condition is given here, as its exact nature is yet uncertain.

The incidence of the disease is greatest amongst girls at and about the period of the second dentition. The onset is acute, and accompanied by irregular fever. The condition of the joints resembles that of the acute fibrous variety of rheumatoid arthritis ; they are swollen and soft, without much synovial fluid. The elbows, wrists, fingers, knees, and ankles are symmetrically involved, and the spine is peculiarly liable to attack. The joints are stiff and painful, but there is no grating or crackling on movement : they are apt to get fixed in the flexed position unless corrected by splinting. There is profuse sweating, wasting of the muscles and debility, and anæmia and emaciation progress rapidly.

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The wasted muscles contract, giving rise to various deformities, but no reaction of degeneration is noted.

In these points the disease resembles acute rheumatoid arthritis, but there are the following marked differences. The liver and spleen are enlarged; the lymphatic glands enlarge, first those in the immediate neighbourhood of the joints, and later the glands generally all over the body: the eyes become prominent, and the general development becomes arrested. Unlike rheumatoid arthritis, the disease, which may be prolonged over years, generally terminates fatally, though one of Whitman's cases recovered.

Pericarditis may be present, and Parkes Weber showed a case with enlarged liver and endocarditis at a meeting of the Medical Society of London in 1902. One of Whitman's cases was extensively covered with scaly eruption like lichen scrofulosorum. As in some instances arthrectomy has been performed upon the joints with a view to alleviating the condition, we are familiar with their pathological state. The capsule of the joint is thickened, the synovial membrane injected or replaced by granulation tissue, and the synovial fluid increased in quantity.

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There may be fibrous adhesion within the joint, and the cartilages are pitted or superficially eroded. In some cases where the liver, spleen, and kidney were enlarged these organs have shown lardaceous changes.

Further observations on this disease, with careful bacteriological examinations, are necessary before it will be possible to decide upon the relation which it bears, if any, to rheumatoid arthritis. Some of the cases cited by Still are suggestive of a general subacute tubercular infection. I am indebted to Dr. Royal Whitman of New York for the permission to publish the accompanying illustration of the disease (fig. 19).

Prognosis.—Rheumatoid arthritis is never a fatal disease, and the chief interest in the prognosis centres around the question of the progress of the disease and the extent to which it will cause crippling of the joints.

If the disease be recognised early, and if a definite exciting focus of infection can be determined and removed, there is every prospect of a successful issue.

Acute cases following on rheumatic fever, and such as are marked at their onset by much pyrexia, are often very intractable,

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as also are those with marked nervous symptoms and vasomotor disturbances. In such there should be given a very guarded prognosis, for there is the possibility of years of suffering and permanent joint fixation. Occasionally we see rheumatoid arthritis complicated by gout, but such cases are seldom severe. It is worthy of note, too, that those cases which show Heberden's nodes are generally mild and non-progressive.

The structural alterations which exist in the bones in chronic rheumatoid arthritis are of course permanent, but in most a degree of improvement in the mobility of the joint may be promised if the patient will submit to a prolonged course of treatment, and the possibility of relapses will depend upon whether it is possible to place the patient under the most favourable conditions of climate and general hygiene.

Success in treatment is dependent upon many factors. The chief of these are: that the disease be recognised in its initial stages; that the exciting cause of the disease can be localised and removed; and that the patient is in the position to undergo the requisite treatment, and to persevere with this for many weeks or months.

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Diagnosis. — The disappointing results which so often reward the most careful treatment of rheumatoid arthritis, are due to the fact that the treatment is undertaken too late, and that during the early stages the arthritis has been treated on wrong principles. A common mistake is to attribute the arthritis to a strain or other accident, and to treat the local condition altogether apart from the general constitutional state. It is only when other joints become involved that the condition is recognised, and the general symptoms of rheumatoid arthritis are found to exist. We ought to suspect the existence of the disease whenever a chronic arthritis results from some trivial strain, and more especially if the joint condition persists in spite of the usual remedies.

Acute and subacute rheumatism or gout are frequently diagnosed as osteo-arthritis. In gout there is no lipping of the joints, and these are not symmetrically attacked. The concretions around the joints, and the synovial fluid, may on examination be shown to contain acicular crystals of soda biurate, and we have found it of service in some cases to extract a little material, and by the detection of the crystals to establish the diagnosis of

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gout. This disease, unlike osteo-arthritis, is commonest in males, and in persons of plethoric habit. Its onset is acute and sudden, with redness and œdema of the joints. The temporo-maxillary joint is never attacked, the big toe frequently.

The arthritis of acute rheumatism differs from that of rheumatoid arthritis in that it moves rapidly from joint to joint, beginning in the larger, and later attacking the smaller joints. It results in no lipping or bony deformity of the joint, and is often accompanied by other rheumatic phenomena, endo- or peri-carditis, erythematous rashes, chorea, &c. A very distinctive characteristic of rheumatism is the relief afforded by the administration of salicylates. It is, however, our opinion that acute rheumatoid arthritis may follow directly upon acute rheumatism; the change in the disease being brought about by some modification of the *diplococcus rheumaticus*. Errors in diagnosis will be less frequent if we recognise the importance of vasomotor and nervous symptoms in rheumatoid arthritis, and in all cases look for the characteristic rapid pulse, pigmentation, sweating, and neuralgia.

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Gonorrhœal synovitis in the acute stage may be mistaken for rheumatoid arthritis, but is distinguished from it by the fact that there is a recent history of gonorrhœa, that the larger joints are attacked, and the arthritis shows little tendency to involve a number of joints. Gonorrhœal synovitis is commoner in men than in women, and frequently terminates in an intra-articular fibrous ankylosis, a condition comparatively rare in rheumatoid disease. A bacteriological examination of the joint fluid will occasionally settle the diagnosis. A form of chronic arthritis which follows gonorrhœal infection is indistinguishable from osteo-arthritis, and in our opinion a chronic rheumatoid arthritis may result from an attenuated gonococcus poison. Arthropathies associated with nervous diseases, such as Charcot's joints as seen in tabes, are distinguished by the absence of pain, the free effusion of fluid, the abnormally free movement, and by the presence of objective signs of nervous disease.

The swelling of a joint in the rheumatoid arthritis of children may lead to a suspicion of tubercular disease, but the rapidly succeeding implication of other joints, and appearance

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of other symptoms, such as pigmentation and sweating, should soon lead to a correct diagnosis being formed. In any doubtful case of arthritis, where there is a suspicion that the condition is tubercular, the injection of tuberculin should be resorted to.

Acute rheumatoid arthritis is, in our experience, far from common, and the cases do not constitute 5 per cent. of all cases of rheumatoid disease which come for treatment. Not infrequently they are treated as cases of acute rheumatism, and the subsequent ankylosis and deformity of the joints is spoken of as being due to chronic rheumatism. The points which serve to distinguish acute rheumatoid arthritis from osteo-arthritis are: the acute onset and nature of the illness; the absence of bony or cartilaginous proliferation; the abnormal translucency of the bones, as evidenced by skiagraphy; the greater tendency to fibrous ankylosis; the more marked nature of the trophic and nervous disturbances; the younger age of the patients; and the more frequent association with rheumatic fever.

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TREATMENT

As we have stated elsewhere, in order to effect an absolute cure in rheumatoid arthritis, there must be early recognition of the disease, and the discovery of a source of infection which is capable of removal. Long before the arthritis has given rise to the characteristic changes in the appearance of the joints, and before alterations in the bones can be detected by means of X-rays, the condition should be recognised by the symptoms, pain, stiffness, and creaking, combined with one or more of the associated signs of sweating, pigmentation, rapid pulse, and neuralgia. By careful examination we should then attempt to find the determining cause of the disease, search being made for chronic inflammatory conditions in the nose, ear, and throat, for oral sepsis, or for localised suppuration in bone or skin. In women such conditions as endometritis, endocervicitis, and vaginitis are to be looked for; and in men the urine should be centrifugalised and examined for pus, which may lead to the detection of some genito-urinary lesion. It should, too, be remembered that the origin of the toxin

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may be from the lungs, stomach, and bowels, and attention should be directed to the state of the digestion, to dilatation of the stomach, and to constipation. Should examination fail to reveal any localised inflammatory or suppurative lesion, then a rheumatic origin of the disease may be suspected, and this may be confirmed by the patient's history and by the presence of cardiac complications.

Having discovered by our examination the condition which is exciting the arthritis, treatment suitable for the control or removal of this condition should be at once commenced. Just as in gonorrhœal rheumatism we see an improvement in the arthritis follow upon cure of the urethritis, so in rheumatoid arthritis we may note a rapid improvement and final disappearance of the joint-symptoms after procedures have been adopted for preventing oral sepsis, for draining an antral cavity, for restoring to a healthy condition the uterus or cervix, or for correcting some irregularity of the stomach and bowels.

This seeking out of a primary focus of infection, and the correction of the fault when found, is the first and most important step in the treatment of rheumatoid arthritis.

Cases in which no such toxic centre can

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be found, and cases apparently of rheumatic origin, are amongst the most intractable and difficult to deal with, for in such we have a constant supply of the toxin still being thrown into the system, and we can only hope to ameliorate the general condition and relieve the painful arthritic symptoms.

In cases of old standing, treatment is directed to the prevention of a recurrence of the disease by correcting any unhealthy condition that may exist, to preserving the general health, and to improving the mobility of the affected joints as far as possible.

These results are brought about by attention to the diet and hygiene, by the administration of drugs, by baths, electricity, massage, and passive movements, and by the application of external remedies.

Diet, Hygiene, and Climate.—If we except a few cases complicated with gout, and cases occurring in plethoric elderly women at the climacteric, it will be found that sufferers from acute and chronic rheumatoid arthritis are greatly benefited by a more than usually nutritious dietary. It is desirable to increase particularly the nitrogenous and fatty constituents. The most easily assimilable form of nitrogenous food is meat, and at least two

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meat meals a day should be given, and if the teeth be defective, or the digestion impaired, the fresh meat should be minced. Some sufferers from rheumatoid arthritis, who are dyspeptic, do exceedingly well on an entirely meat diet formed upon the model of the "Salisbury" treatment. In this treatment two to four pounds of lean beef are taken in the twenty-four hours. The meat is minced with a little water, seasoned, and very lightly stewed, or, it may be, made up in cakes and grilled. Three to five pints of hot water are taken daily, being given partly one hour before meals, and partly half-an-hour before going to bed. Many people object to this regimen, and it will generally be found preferable to first try adding one meat meal a day of a grilled chop or steak to the ordinary diet. Where meat is not tolerated, Plasmon or Sanatogen and milk make efficient substitutes. The increased quantity of fat is best given as milk and cream, the patient being directed to drink half a pint of hot milk two or three times a day, and to keep some warmed milk-food at the bedside to be taken in the night if wakeful. Fat may also be taken, as cream with fruit, or as bacon, or in increased quantity of butter.

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Starchy foods and sugar being prone to excite flatulent dyspepsia, and being generally less assimilable than nitrogenous food in the form of meat, are to be limited. If the patient will observe strict caution in the use of sugar, it need not be entirely cut off. It is well to limit the daily amount of carbohydrate taken, defining the weight of toast, biscuit, and bread which is permissible.

Vegetables and fruit may be taken freely. Stimulants are often of service as an aid to digestion and appetite, and stout has been largely recommended for this purpose.

A special dietary will be required for those suffering from dilatation of the stomach, or dyspepsia.

When the jaw is fixed, it may be necessary to mince or finely divide all the food, and in some cases the incisor teeth have to be removed in order that food may be introduced.

The clothing must be warm, the under-clothing of wool at all seasons of the year. Warm gloves and mittens for the hands, and socks of extra thickness are of great service to sufferers from rheumatoid arthritis, who are afflicted with cold hands and feet. Cold generally increases the pain and stiffness of the joints, and warmth relieves these conditions.

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Exercise in the fresh air is essential, not only for the preservation of the general health, but also to maintain the mobility of the joints. Patients are apt to shirk taking the proper amount of exercise, on account of pain and stiffness, but every effort should be made to make them persevere, and in unfavourable weather it should be taken indoors. Fatigue is to be avoided as tending to an exacerbation of the symptoms. Where the crippling of the joints forbids walking exercise, a daily drive in a wheel-chair or carriage should be taken whenever the weather permits.

The painful arthritic symptoms are often aggravated by sudden changes of temperature, by damp, and by cold east winds; for this reason residence in dry, warm, equable and sunny climate is to be desired, and a damp, cold clay subsoil, or neighbourhood of a river-bed should be avoided. Residence at the seaside sometimes seems to aggravate the symptoms of the disease, and the more mildly bracing inland situations are preferable. During the summer months benefit is to be obtained by a stay at one of the more bracing British inland watering-places—Buxton, Harrogate, Woodhall Spa, Strath-

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peffer, Droitwich, and Llandrindod Wells. During the winter months, for those to whom it is feasible, residence in the warm sunny climate of Algiers, or Egypt, is of the greatest service; whilst in this country the climates of Bath, Clifton, Malvern, or Tunbridge Wells are most beneficial.

A change of air and surroundings, by improving the appetite and general condition, frequently alleviates or arrests the progress of the symptoms altogether, apart from any local or general medicinal remedies.

During the acute stage of the disease the patient should be kept in bed. The diet should be light but nutritious, the room fresh and airy, warm, and in the sunniest position. Whatever treatment be adopted for the arthritis, care must be taken that the joints do not assume a faulty position, in which they might get fixed—thus the knees must be fully extended, and the elbows flexed. As soon as the arthritis shows signs of abating, gentle passive movements should be made. The whole body should be sponged with warm water daily, and the bowels regulated by an occasional aperient.

Treatment by Drugs.—Rheumatoid arthritis is not directly controlled by the action of

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drugs, but by a judicious use of suitable medicaments we may hope to combat the gastro-intestinal disorder which may be exciting the disease ; we can alleviate many of the more distressing symptoms, and improve the general health, and so increase the resistance of the tissues.

Antiseptics.—The administration of creosote compounds, guaiacol, guaiacol carbonate, salol, salophen, β -naphthol, has been much advocated in the treatment of rheumatoid arthritis.

Bannatyne, who has made an extensive trial of guaiacol carbonate, regards it as having a specific action in this disease, but in our opinion this and other antiseptics act by controlling the excessive growth of bacteria in the stomach and intestines (a condition common in rheumatoid arthritis and other debilitating conditions), and thus lessening a toxic absorption which may be the exciting cause of the disease. Whatever the explanation of the action of the drug may be, there can be no doubt that many cases of rheumatoid arthritis, especially such as are accompanied with fermentative dyspepsia, are much relieved by the administration of these antiseptics. The most effectual is

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guaiacol carbonate, and this may be given in milk, or in cachets, 5 to 10 grains, three or four times a day, continued over many weeks or months.

If there be dilatation of the stomach, it should be systematically washed out, and fermentation reduced by the administration of hyposulphite of sodium in doses of 20 to 30 grains. Intestinal fermentation is sometimes markedly benefited by the administration of salol. The weak antiseptic and cholagogue properties of the salicylates may in part account for the benefit which sometimes follows their administration in rheumatoid arthritis.

In cases of oral sepsis the mouth should be frequently washed out with listerine or formalin diluted with water, and the earliest opportunity taken to extract or fill all carious teeth, and to replace them by an artificial plate.

For the relief of pain, which in both acute and chronic cases is often of a distressing character, sodium salicylate or aspirin may be given in full doses, and are sometimes very effectual. Antipyrin will sometimes afford relief, and should both these fail, recourse may be had to hyoscyamus, chloral hydrate, or morphia. Other drugs used for this purpose are Tinct. Cimici-

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fugæ, m xxx. twice or three times a day, and Liq. Auri et Arsenii Bromidi, m. v to x mins. It is preferable, however, in all cases to relieve pain by means of baths, or by applications applied externally to the joints.

Tonics.—Cod liver oil is a most valuable remedy in rheumatoid arthritis. It may be given in doses of from two to four teaspoonfuls three times a day, either alone or in an emulsion, or combined with malt extract. The oil must be taken persistently for months, and in many cases there results an increase in the body weight, greater movement in the joints, and an absence of those frequent recurrent attacks which characterise the disease. Cod liver oil is especially beneficial if the patient be emaciated and weak, and if there have been previously a history of worry and impaired digestion.

Arsenic given in increasingly large doses over a long period acts as a general stimulant to the tissues; the appetite and digestion improve, the body weight increases, and the blood is enriched. With a return to normal health the patient's power of resistance increases, and the arthritic symptoms are kept in abeyance. Arsenic may be administered as Fowler's solution, or as arsenious acid ($\frac{1}{24}$ grain).

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Iron may be given alone or combined with arsenic. The best preparations are the ammonio-citrate and reduced iron. Other preparations are more liable to upset the digestion, and we have found this an objection to the syrup of the iodide of iron, which is recommended largely for this disorder.

Iodine and its compounds ~~we~~ have generally found of little value when given internally. Potassium iodide has been recommended in those cases in which the pain is increased by warmth, and in extremely chronic osteo-arthritis.

Other tonics, such as quinine, strychnine, mineral acids, and vegetable bitters, are of service from time to time to improve the appetite and general condition.

Local Treatment.—The application to the joints of various remedies for the relief of pain, or with a view to diminishing inflammation, has been extensively practised in the treatment of rheumatoid arthritis. It should, however, be remembered that such measures are purely palliative, and that unless the exciting cause of the disease has been discovered and treated, the condition will be a progressive one in spite of any and

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all measures adopted for the treatment of the joints.

For the relief of pain warmth is very efficacious; the joint may be wrapped in a hot fomentation sprinkled with glycerine of belladonna, or it may be bathed with hot water, or the patient may take a hot bath before going to bed. In the acute stage relief is sometimes afforded by immobilising a painful joint. Thus the knee-joint may be strapped and placed in a light splint, or the hip extended by means of a weight and pulley. The joint should not be kept too long in splints without occasional passive movements, as adhesions may form.

A mixture of equal parts of the liniments of aconite, belladonna, and chloroform rubbed into the joint is a useful anodyne, and we have also found mesotan, with olive oil, or as a 25-50 per cent. ointment with lanoline, to afford great relief. Methyl salicylate, with three parts of olive oil, or with six parts of tincture of iodine, may be thickly painted over the painful articulation, which should then be covered with lint and oil-silk and lightly bandaged.

Of counter-irritants, iodine and blistering agents are the most efficacious. A solution of

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40 grains of iodine, with 10 grains of iodide of potash in an ounce of methylated spirit, may be painted on daily until the skin is tender.

When the arthritis is very active and painful, numerous small blisters the size of a shilling may be placed around the joint, two or three each night; or a ring blister, half an inch to an inch wide, on the cardiac side of the joint may be employed.

Latham recommends continuous counter-irritation over the section of the spine corresponding to the part involved. Thus in an early acute polyarticular affection of the upper limb, or in an exacerbation in a case of old standing, a blister three inches by two is painted over the cervical spine, and kept open for fourteen days by a dressing of *Ung. Sabinæ*.

In milder cases relief is often secured by the application of such counter-irritants as turpentine, or acetic turpentine liniment, tincture of capsicum sprinkled on lint, or *Ung. Capsici*.

Operative Procedures.—When a joint or bursa is tightly distended with fluid, leading to pain and limitation of movement, the synovia may be drawn off by means of an exploring syringe. This is chiefly required

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in the case of the knee and elbow joints; temporary relief is afforded, and we have never seen any ill results follow.

If the knees or hips be flexed owing to spasm and shortening of the muscles (as is not infrequently the case if the disease has been of long standing, and the patient confined to bed without attention being paid to position), a weight and pulley similar to the apparatus employed in hip-joint disease should be employed, and will in time correct the deformity.

Ankylosis of a joint may be partial or complete, and may be due to thickening of the capsule, to fibrous adhesions within the joint, to osteophytic outgrowths, or to the matting and contraction of structures outside the articulation. Before any attempt is made to break down adhesions, a thorough examination of the joint should be made, and a skiagram taken.

If after prolonged treatment by massage and baths the movement in one or more joints be impaired, and if the disease appear to be quiescent, adhesions may be broken down by forced movements, a general anæsthetic having first been given.

It is exceedingly difficult to indicate in

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what class of case the breaking down of adhesions is advisable. In the fibro-arthritic type of disease the operation is sometimes followed by a recrudescence, and this is likely to be the case unless the disease has been for some time quiescent. In elderly persons the procedure is seldom justifiable, and where the ankylosis is bony and the joint in a good useful position, it should not be interfered with.

The joint adhesions having once been broken down, passive movements and massage should be given daily, and occasional local hot-air baths prescribed.

In young persons, in whom serious crippling of a joint, such as the elbow or knee, must entail loss of employment, and in whose case the breaking down of adhesions has proved a failure, excision of the joint may be advisable. We have seen a very good result follow a partial arthrectomy.

Massage and Baths.—As soon as the acute stage of the arthritis has subsided, benefit may be obtained from massage and passive movement. Whilst the patient is still confined to bed, half-an-hour's general massage night and morning may be given, and in this way the general nutrition of the patient is

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improved, and the amount of muscular wasting reduced to a minimum. The thickening around the joints, and the stiffness on movement, gradually diminish under the rubbing and passive movement, but in order to secure the best results treatment must be begun early, and continued over many weeks.

Many old cases of the osteo-arthritis type, with much deformity of the joints, are benefitted by rubbing, which improves the condition of the muscles acting upon the articulation. Similarly, it is suitable for early cases in which the predominant symptom is the progressive muscular atrophy.

The combination of hot douches with massage, known as the Aix douche, is now to be obtained at most of the British and continental spas. The Aix douche bath is not suitable for joints in the tender subacute stage, but as the joints stiffen, and the pain becomes less, the massage and passive movements can be tolerated, and these, combined with warm douching, greatly improve the mobility of the limbs.

With regard to the value of baths generally in the treatment of rheumatoid arthritis, there can be no doubt that the chemical properties of the water are a matter of small

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importance, the chief point being the mode of application. The objects attained by warm bathing are: A general improvement in the patient's strength and nutrition; increased elimination by the skin; decrease of pain and stiffness in the joints; and absorption of the swelling around the joints. The treatment may in part be carried out in the patient's home, and, where possible, should be combined with massage. In slight cases, with pain and stiffness in the joints, but with no objective symptoms, a hot immersion-bath (100° F.) three days a week should be tried. Such can be obtained in most of our large towns by the poorer classes for a few pence. By a simple fitting to the ordinary domestic bath-tap, it can be made to deliver a hot and cold douche as desired, and this alternating stream of hot and cold water (Scotch douche) promotes absorption and relieves pain.

The advantages of a course of bathing at a British or Continental watering-place consist not in any special medicinal virtues possessed by the waters, but in the fact that the treatment is carried out by persons of experience and skill. The patient's general health, too, is improved by the

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change of air, the alteration in diet, and freedom from home cares and duties.

In this country, Bath, Clifton, Harrogate, Buxton, Woodhall Spa, Strathpeffer, Llangammarch, Llandrindod Wells, and Droitwich are suitable; whilst on the Continent of Europe Aix, Aachen, Wiesbaden, Homburg, Carlsbad, Kissingen, Wildbad, Isch, and Aqui are much frequented.

The locality chosen will depend on the nature of the case and the season of the year. ~~High June 69-70~~

Local vapour-baths may be used to reduce the pain and stiffness; but general vapour-baths and Turkish baths are not as a rule beneficial, and if persevered with may do much harm. The morning cold-plunge bath should not be taken by sufferers from rheumatoid arthritis. For patients who cannot afford special baths, boxes of fine sand heated in the oven may be employed, the hands or feet being buried in the sand. Hot-air baths are particularly suitable for slight cases of osteo-arthritis with pain and fixation of the joints, and they may also be used with advantage immediately following the breaking down of adhesions. The Tallermann bath is suitable for this purpose. The affected joint

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is kept in the bath for half-an-hour daily, at a temperature of 300° F. *High tone* 102°

Electrical Treatment.—The treatment of rheumatoid arthritis by means of electrical baths is useful in all stages of the disease. A full-length bath of a temperature of 99° to 100° F., in which the patient sits immersed to the neck, is preferable to smaller baths, suitable only for application to a single limb. For the purpose of the bath the direct current from the lighting mains may be used, or preferably the sinusoidal current from an alternate current light supply. The supply is regulated by a transformer, and the current varies from 100 to 200 milliampères, of which it is calculated that about 25 per cent. passes through the patient. The current must be turned on and shut off slowly, so as not to give an unpleasant shock to the patient. Baths may be given every other day, and should be of fifteen or twenty minutes' duration. They should be persevered with for at least a month. By means of handles and special apparatus the current may be brought to bear with greater intensity on any one particular part of the body. Where full-length immersion-baths cannot be given, an arm

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or leg bath may be improvised. Nine or ten Leclanché cells, giving a total current of from 25 to 30 milliampères, will suffice for such a bath.

The hydro-electric bath gives better results than the direct application of galvanism to the skin, although this and treatment by the faradic current are of the greatest service in promoting the general nutrition and tone of the muscles.

The radiant-heat or electric-light bath may be given alternately with the hydro-electric bath. It has a marked stimulating effect on the local circulation. Caution should be exercised in the administration of the electric-light bath, as there is a risk of burning the patient. In one case a patient under my care was given a radiant-heat bath at one of our English spas, and was severely blistered, the injuries taking many months to heal up.

Very obstinate joints not yielding to ordinary measures may be treated with potassium iodide, or sodium salicylate introduced locally by means of kataphoresis.

Patients should not be led to expect too much from electrical treatment. Bony proliferation and erosion, destruction of ligaments

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or articular surfaces cannot be remedied ; and, at most, electrical treatment can only be hoped to arrest the progress of the disease and ameliorate the general and local conditions.

The electric immersion-bath has a stimulant and alterative effect upon the general nutrition, and by quickening the circulation and dilating the local vessels, it leads to removal of inflammatory products and lessening of the swelling and pain.

High frequency currents, by improving the general nutrition of the patient and restoring the nervous tone, are sometimes of service, but the local conditions are very little affected.

Judiciously applied, electrical treatment is of the greatest service in rheumatoid disease. In acute cases the pains are relieved and the progress may be arrested by hydro-electric treatment ; in chronic cases increased mobility, freedom from pain, and improvement in the general health will result if electricity be employed of the right kind, and in the manner most suited to the case. It is much to be regretted that the promiscuous and ill-advised use of all sorts of electrical treatment is likely to bring this method into disrepute.

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“CHRONIC RHEUMATIC ARTHRITIS”

In elderly people osteo-arthritis sometimes assumes a very characteristic type, so much so that it has been described as a separate disease, under the title of *chronic rheumatic arthritis*, *malum coxae senile*, or *senile monarticular arthritis*.

The condition met with in such cases is a slow, progressive degeneration of the tissues of usually one of the larger joints, with absorption and proliferation of bone, but without general nervous or trophic symptoms.

Chronic rheumatic arthritis is only osteo-arthritis modified by its occurrence in old people, and occasionally the condition is seen to spread to several joints, and to be associated with the development of Heberden's nodes. The cases of monarticular affection, however, form so definite a clinical picture, and the pathogenesis is so obscure, that we have considered it best to describe the disease altogether apart from osteo-arthritis.

Chronic rheumatic arthritis is met with more frequently amongst males than females. Whilst men of middle life in apparently

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perfect health are occasionally afflicted, the disease is most common between the ages of sixty and seventy-five years, and is associated with the changes in hair, teeth, and arteries which are found in senility. No history of rheumatic fever or gout can usually be elicited, but patients frequently state that there has been rheumatic pain in the joint for years, or else a history of some injury is volunteered. The injury which is supposed to have started the arthritis is sometimes very trivial, or may have affected parts at some little distance from the joint; thus a fracture of the humerus, or injury to the soft parts of the upper arm, may be the starting-point of rheumatic arthritis in the shoulder. In such cases the degeneration of the articular structures has been thought to be of reflex nervous origin, but it seems more likely that it is due to the presence of toxic bodies formed at the site of injury. Arbuthnot Lane attributes these joint changes entirely to mechanical causes; thus the repeated strain and jar of using a shovel may excite the condition in the shoulder-joint, or the constant carrying of weights in one position may lead to degenerative changes in the hip-joint. In some cases a

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septic focus or some derangement of digestion is present, such as might prove the source of a chronic toxæmia.

The pathological changes may be illustrated from those seen in an old-standing case of chronic rheumatic arthritis of the hip-joint. The synovial membrane and capsule are thickened and chronically inflamed, the round ligament destroyed, and the articular cartilages eroded away. The head of the femur is flattened and irregular, and lies at almost a right angle to the shaft. The neck of the bone is shortened, the bony structure being softer, and more cancellous than usual, having undergone absorption. Around the great trochanter, in the intertrochanteric line, masses of bone are thrown out. The acetabulum is roughened, and may be shallowed and wider, or narrower and deeper than usual, according to whether the osteophytic outgrowths have taken place chiefly at the rim or inside the socket. The muscles and soft tissues around the joint are wasted. The changes found in the knee and shoulder, when these articulations are attacked, are similar to the above. Bony ankylosis may take place. These changes resemble those seen in osteo-arthritis, but

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are intensified in character. The proliferation of bone and thickening of structures around the joint is seen in the skiagram taken from the case of A. S. (fig. 20).

Symptoms.—The joints most frequently attacked are those nearest the trunk—the hip, shoulder, and knee. The spinal joints may also suffer. As a rule one joint only is attacked, but exceptionally the affection is symmetrical. Cases have been described in which the disease commencing in one joint has extended to others, finally attacking the smaller articulations of the hands and feet.

The earliest symptom is pain. This is generally ascribed to rheumatism, neuralgia, or sciatica. The pain is intermittent, of a gnawing character, worse in damp, cold weather, troublesome often at night, and aggravated by movement. In the hip the pain is sometimes located just over the trochanter, or it may radiate down the back of the limb to the knee-joint, or be referred to the groin. If the shoulder be the diseased joint, the pain is felt over the scapular region, and down the brachial plexus. Pain may be the only symptom for years, but there gradually ensues stiffness, limitation of movement, and grating in the articulation.

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Standing or walking gives rise to pain in the hip, and by degrees the movements become impaired, so that if the patient be asked to cross the affected leg over the sound one, he cannot do so without putting his hands to the thigh to assist the movement. If the power of rotation be tested, it will be found to be much impaired. On comparing the two limbs, it will be found that there is considerable shortening on the affected side, and that the gluteal and thigh muscles are wasted. The leg is generally held in the position of external rotation and adduction, and in walking the heel is raised and the foot is put down very gently, the patient being obviously afraid of any jarring. The pelvis is tilted towards the sound side, and this increases the apparent shortening of the limb. As the movement in the hip becomes more impaired, the patient experiences increased difficulty in flexing the body, and avoids stooping as much as possible. In sitting he turns sideways, and occupies the front edge of the seat, so that the leg may be stretched out almost in a straight line with the body.

Examination of a joint may show considerable thickening due to bony outgrowths,

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and these are more easily detected in the knee and shoulder than in the hip. Any attempt at passive movement is painful, and grating and crackling can be felt and heard. There is seldom much excess of synovial fluid, but large bursæ are often present around the articulation. These bursal sacs are commonest at the knee-joint, and are said to be outpushings of the synovial sac which have become pedunculated and nipped off. A case of chronic rheumatic arthritis of the knee-joint under our care illustrates the condition met with when this articulation is involved.

A. S., a man aged sixty-nine years, was admitted under my care to the Bristol General Hospital suffering from pain and swelling in the right knee. Many years previously he had slight rheumatism in the ankles, knees, and shoulders, but did not give up work. No other history of illness or accident. The pain and swelling in the right knee commenced five years ago, and has steadily progressed. He attributes it to the fact that as a young man he for many years carried a heavy baker's basket, and this put great strain on the right leg. On admission the patient was suffering from

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slight bronchitis, and from emphysema and cardiac failure, giving rise to oedema of both legs. All the joints were carefully examined, and with the exception of the knees they were normal. The left knee was found to creak on movement, but there were no other objective or subjective signs of disease. The right knee was more than an inch larger in circumference than the left. There was no redness or heat of the skin, and no excess of synovia. It was not painful unless during walking or standing, when it might also, as the patient described it, "feel weak, give way, and get out of joint for a bit." The knee was slightly flexed, and in the position of genu valgum. Palpation showed the synovial membrane to be thickened, the lower end of the femur enlarged, and the edges of the bones lipped. Movement was limited, and gave rise to crackling and creaking in the joint, and to a peculiar sickening, grating sound and feeling. The right calf measured an inch less than the left, but the circumference of the right thigh immediately above the knee-joint was larger than the left, apparently due to thickening of the subjacent bone. The skiagram (fig. 20) shows proliferation of the bone around the tibia,

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femur, and patella, and general thickening of tissue round the joint.

When the shoulder-joint is affected, the movements of the arm are much impaired, and arm and scapula move together. The patient may be unable to put the hand to the back of the head, or even raise the limb to the level of the shoulder. The deltoid and shoulder muscles show much wasting, but the muscular wasting in this disease is entirely due to disuse. The deep reflexes of the affected limb are exaggerated.

The temporo-maxillary articulation is sometimes the seat of chronic rheumatic arthritis ; the condyle of the jaw enlarging, and the articular eminence being destroyed. Generally both sides of the jaw are diseased, and there is pain and creaking when the mouth is opened. The inferior maxilla may slip forward, giving the patient the appearance of being under-hung, or it may be twisted a little to one side, giving the face a distorted appearance.

Prognosis and Diagnosis.—“Chronic rheumatic arthritis” is often diagnosed as sciatica. It is to be distinguished from this condition by the difficulty in crossing the legs and evertting the foot. In arthritis, too, if a jar be given to the sole of the foot, pain in the joint

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is complained of. The pain in *morbus coxæ senilis* is more commonly referred to the great trochanter than to the buttock, and there is no tenderness along the course of the sciatic nerve such as is present in *sciatica*. Only a careful inquiry into the history of the case can distinguish between chronic rheumatic arthritis and old intracapsular fracture of the neck of the femur.

The disease is extremely chronic in its course, and though generally monarticular it may exceptionally spread to other joints.

Treatment.—For successful treatment the condition must be diagnosed in the early stage before marked bony changes have ensued. Persistent rheumatic pains confined to one joint and increased in movement occurring in an elderly person, without previous history of rheumatism, should lead to suspicion of "chronic rheumatic arthritis." As far as possible all excessive strain on the part should be relieved, the general health maintained, and exposure to cold and wet avoided. The local condition should be treated with a weak galvanic current, with Aix douche-baths, and massage. Turkish baths and hot immersion-baths are not suitable for these cases.

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Should the condition progress, counter-irritation over the joint by liniment of iodine or by blisters may be tried.

In old standing cases the greatest relief is afforded by the hot-air bath, such as that employed in the Tallerman treatment. A daily bath of half-an-hour's duration, at a temperature of 300° F., may be given for a fortnight. Electric-light baths also relieve pain and increase the range of movement, but with these there is the greater risk of burning the limb.

Salicylate of soda or aspirin will often relieve the pain in the joint, and iodide of potash is also useful in old chronic cases.

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V

GONORRHŒAL RHEUMATISM

Definition.—A subacute or chronic non-suppurative arthritis with constitutional disturbance due to a general infection by the gonococcus and its toxin.

There is now a sufficient mass of evidence to enable us to state that this form of arthritis is caused by a general systemic invasion by the gonococcus, and that it is not to be regarded merely as an attack of rheumatism complicating gonorrhœa, or as a pyæmia due to one or more of the many other pyogenic organisms present in the urethral discharge.

The clinical evidence upon this point will be dealt with later, and the bacteriological evidence may be briefly summarised as follows: Micrococci have been isolated during life from the blood of persons suffering from gonorrhœal rheumatism and ulcerative endocarditis, and these organisms have been shown to be identical in morphological char-

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acter, growth on culture media, and staining reactions, with gonococci. Cultures taken after death of such cases have shown gonococci in the cardiac vegetations, pleural effusion, blood, and joint fluids. One observer inoculated a small thrombus from a case of gonorrhœal ulcerative endocarditis into the healthy human urethra, and excited a true gonorrhœa. A large number of instances are now on record in which pure cultures of gonococci have been obtained from the fluid of inflamed joints ; they have also been obtained from the tendon sheaths and from pleuritic fluid.

It is often difficult to detect gonococci in the joint fluid, and we have ourselves failed to do so in the only three cases which we have examined. This may be because the coccii are only present in the fluid during the early stage of the disease, and later take up their abode in the synovial membrane. Possibly it is because gonorrhœal arthritis may be the result of a toxin, and there is some evidence to prove that a gono-toxin is formed, and is capable of exciting both local and general reactions.

As the detection of gonococci in joint fluid is often a point of the utmost diagnostic value, we suggest the following method of

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examination. The fluid is drawn off in a carefully-sterilised exploring syringe. If the quantity be small, it is at once transferred to a series of agar and blood-agar tubes (containing more than the usual quantity of blood), and incubated in the thermostat. If there be a larger supply of fluid, it should be immediately centrifugalised, and the sediment added to the nutrient media. In both cases a portion is kept for immediate examination. The distinctive features of the organism are (1) flattened diplococci in groups of eight or sixteen lying within a cell; (2) decolorisation by Gram's method of staining; (3) growth on blood-agar, but not on agar, or gelatine.

Gonorrhœal arthritis is commonest in young persons between the ages of twenty and thirty. It is more rarely seen in children and infants secondary to purulent gonorrhœal ophthalmia.

Statistics show that the disease is more common in males than in females. Whilst this is in part due to the fact that it is more difficult to detect slight gonorrhœa in women, and that inquiry into the existence of the condition is seldom made, it is also in part due to the fact that in women the mucous membrane of the vagina and cervix is thicker

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and less absorbent than that of the male urethra, and the free outflow of the discharge is not impeded. Chronic gonorrhœa in the female is more a vaginitis than an urethritis.

Persons of a gouty and rheumatic temperament are more liable to gonorrhœal arthritis than are others, and having once suffered there is an increased risk of the arthritis returning with any subsequent attack of gonorrhœa. The severity of the urethritis bears no relationship to the onset of rheumatism, and it may follow gonorrhœal conjunctivitis, or vulvitis, or balanitis of gonococcal origin.

Clement Lucas has recorded twenty-three cases of purulent gonorrhœal ophthalmia with arthritis in young infants. In eighteen of these the symptoms of ophthalmia appeared within three days of birth, and the rheumatism followed after an interval of two or three weeks.

The occurrence of such cases in infants is evidence that gonorrhœal arthritis is not excited by any particular line of treatment, such as strong urethral injections, and this has been further corroborated in our experience by cases of rheumatism

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which have followed untreated gonorrhœa. One such case is detailed on page 207.

If the existence of an urethral discharge be suspected the patient's denial should not be depended upon, but the urethra should be inspected and samples of the urine examined for pus cells after centrifugalisation. In women the genito-urinary tract should be examined and coverslip preparations and cultures made from vaginal swabbings.

Symptoms. — The onset of gonorrhœal arthritis is most common in the third or fourth week from the commencement of the urethritis, when the posterior portion of the urethra is being attacked, and when there is more probability of some abrasion of the surface. More rarely the arthritis occurs earlier, even in the first week of the discharge, or it may be delayed until months later. As long as the gonococcus persists in the discharge, so long is there the possibility of gonorrhœal rheumatism, and when the specific organism has disappeared there is yet the further possibility of a pyæmic arthritis if the gleet persist.

Sometimes the urethritis is apparently cured, and the focus of infection is to be

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found in a secondary prostatitis, cystitis, epididymitis, or salpingitis.

The onset is seldom acute; slight pains are complained of in the joints, soles of the feet, heels, or back, and these get gradually worse and limit themselves to certain parts.

The temperature may be normal, and seldom rises above 100° or 101° F. There is no headache, profuse sweating, or thick coating of the tongue.

The disease assumes one of three types, which may be styled (1) monarticular; (2) polyarticular; (3) fibrous. Whilst no hard and fast line can be drawn between these varieties, they are convenient for purposes of classification, and it is only occasionally that we find a case which it is difficult to include under one or other heading.

As an example of the monarticular type we may instance the following: J. M., a healthy male, aged thirty, was admitted to the Bristol General Hospital in October 1903. He had contracted gonorrhœa eight weeks previously. The discharge ceased after three weeks, but there was swelling and pain in the left ankle. This gradually subsided, but a few days before admission the left knee became painful on move-

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ment and much swollen. On admission the left ankle was slightly tender. The left knee was very much swollen, the synovial pouches distended, and the patella floated. It was painful if moved, but otherwise gave no trouble.

The temperature was normal, and the general physical condition sound. About half an ounce of fluid was drawn off from the knee-joint. It was opalescent, faintly alkaline, and contained a few leucocytes and lymphocytes but no gonococci. The patient was treated with potassium iodide and tonics, and after a few days' counter-irritation the joint was firmly strapped over Scott's dressing. At the end of three weeks there was no material improvement in the size or mobility of the joint, and at his own request he left the hospital.

The cessation of the discharge coinciding with the commencement of the arthritis, as in this case, is of interest. It is not uncommon to see a diminution of the local symptoms herald the beginning of the rheumatism.

This type of gonorrhœal rheumatism is particularly liable to attack one of the big joints, such as the knee. Its onset is very

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insidious, and although the joint may be distended with fluid there is little constitutional disturbance or pain, and the skin over the joint is not hot or inflamed. The arthritis is very intractable, being little influenced by any kind of treatment. Rarely more than one joint is affected, and in strumous and cachectic subjects it passes into a condition indistinguishable from chronic rheumatoid arthritis (see fig. 21). The joint fluid in such a case we found to be thick, turbid, almost gelatinous, and coagulated spontaneously immediately it was withdrawn. No gonococci or other organisms could be detected in it. In the majority of cases the joint recovers after a prolonged period of synovitis.

Very rarely this type of monarticular rheumatism assumes a more acute form, the skin over the joint becomes red, hot, and tender, and the inflammation spreads to the neighbouring tendon sheaths and bursæ. The case then looks more like one of acute gout. Such cases are very liable to terminate in fibrous or bony ankylosis.

Polyarticular gonorrhœal arthritis closely resembles in its clinical features subacute rheumatic fever. There may be slight

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pyrexia, the temperature rising to 100° or 101° F. In addition to the arthritis there is inflammation of tendon sheaths and of bursæ, a general aching and stiffness, inflammation of the eye, and rarely pleurisy and heart complications.

The joints most frequently affected are, in order of frequency, the knee, ankle, elbow, hip, wrist, and fingers. Pains in the sole, instep, and heel may indicate an implication of the tarsal and metatarsal joints. The spinal joints, the thyro-arytenoid, the temporo-maxillary, the sacro-iliac, and the sterno-clavicular articulations are also attacked, and an affection of the two latter should always lead to a suspicion of a gonorrhœal origin.

The joints are painful, especially on movement, and the pain is worse at night, and often greater than one would expect from the existing degree of arthritis. Tenderness is not marked, even although the joint is swollen it is not red and tender, nor is the swelling in the tissues around the joint so severe as in acute rheumatism; neither is there the same tendency to migration from joint to joint.

The arthritis is not relieved by the ad-

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ministration of salicylates, but tends to slowly subside in the majority of joints, leaving a chronic synovitis, stiffness, or adhesion in others, most frequently the elbow, knee, or shoulder. Even in cases in which there has been no synovitis (*arthritis sicca*) there may follow some degree of ankylosis. This ankylosis is fibrous in nature, and is due to the thickening of the joint capsule, to shortening of the ligaments, and to fibrous strands within the joint. The synovial fluid in the poly-articular variety will be found to be turbid with serofibrinous flakes.

The synovial sheaths of the tendons of hands and feet may be inflamed, and form a swelling on the dorsal surface, or at the wrist. Bursæ behind the knee or *tendo achillis*, or at the heel enlarge, and weakening of the joints of the feet leads to a painful condition of flat-foot.

In the fibrous form of gonorrhœal rheumatism the tissues attacked are the fasciæ of the sole of the foot, the lumbar aponeurosis, and the cervical fascia. There is pain in these regions even whilst the patient is resting in bed, and pain is increased on movement. There may, too, be complaint of pain in the joints, but these may present no objective

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symptoms. Inflammation of the tendon sheaths and bursæ, and more rarely subacute or chronic periostitis, also accompany this variety of rheumatism, but the most frequent accompaniments are conjunctivitis and scleritis.

H. J. P., a labourer aged twenty-one years, was admitted to the Bristol General Hospital under my care in April 1904. His mother suffered from rheumatism, and one brother has had rheumatic fever. He has always been well, except for occasional attacks of sore throat. About Christmas 1903 he suffered from rheumatism in his feet, but did not give up work. Four weeks before admission he contracted gonorrhœa, but this was not treated in any way. During the first week of the discharge he says he had pain and swelling in both knees, and in the sterno-clavicular joints, and pain across the back. On this account he gave up work. On admission there were no objective signs in the joints, but the knees and elbows were stiff and painful. The soles of both feet were painful and tender, and there was pain in the back of the neck and shoulders, and in the lumbar region, which was much increased on movement, worse at night and first thing in the morn-

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ing. Both conjunctival sacs were inflamed and the sclerotics injected with small vessels. The right sclerotic was more injected than the left, and there was iritis on the right side. There was a slight purulent urethral discharge. Heart and lungs normal. The temperature rose to 100° F. on two occasions, but otherwise was always below 99° F. During his stay in the hospital there was for a few days some small amount of fluid in one knee-joint. Fourteen days after admission the urethral discharge, which had been treated with injections of protargol, ceased, and from this time his pains were much relieved. For a few days there was again swelling in the left knee-joint, but this disappeared under treatment with hot-air baths and kataphoresis with iodide of potassium. In addition to the hot-air bath and electrical treatment to the left knee, patient was given a hot immersion-bath every other day, and tonics were administered. He was discharged in the fourth week with only slight muscular stiffness. Five months later he contracted another attack of gonorrhœa, and was admitted with fever and severe arthritis affecting the knees, ankles, and shoulders. The fibrous tissues previously affected were on this occasion spared.

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It is difficult to say in such cases whether the pain and tenderness in the sole of the foot is due to implication of the tarsal and metatarsal joints, or whether it depends entirely on an inflammatory condition of the plantar fascia. Associated as it is with pain in other aponeuroses, it seems more probable that the trouble is not arthritic. Pain and tenderness over the point of the heel, the instep, or the sole of the foot is very characteristic of gonorrhœal rheumatism.

Whilst it is the tendency of the arthritis to slowly get well, some cases are extremely obstinate, and for months and years there may persist a chronic synovitis affecting one of the bigger joints. If the joints of the foot have been attacked there may remain a painful and crippling form of "flat-foot." In the knee and ankle joints changes may ensue which leave the condition indistinguishable from chronic rheumatoid disease (osteoarthritis). The ends of the bones enlarge, there is lipping of the articular ends, grating and creaking on movement, and a very intractable condition of wasting of the muscles in connection with the joint. We have expressed our opinion elsewhere (page 126) that rheumatoid arthritis may be excited by

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the action of the gonococcus, the nature of the arthritis being determined, we must suppose, by an attenuated virulence of the micro-organism, or by some peculiar condition of the sufferer's bodily health.

Ankylosis of joints is not infrequent in gonorrhœal rheumatism. It is particularly likely to follow in acute cases of the poly-articular variety. Although only fibrous in nature the adhesions are very firm, and may lead to serious crippling. One patient under our care, in whom the cervical spinal joints were attacked, was left with the head permanently flexed and rotated to one side. The knees and elbows are the joints most often ankylosed, and there may be considerable wasting of the muscles associated with these joints.

Sometimes during an attack of gonorrhœal rheumatism the muscles become swollen and tender from a condition of *myositis*. This is commonest in the muscles of the upper arm.

Extension of the inflammation of fibrous structures may involve the nerve sheaths, and give rise to *neuritis* in the brachial plexus or to *sciatica*.

Eye Symptoms.—Acute purulent gonorrhœal ophthalmia is sometimes the mode of

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entrance of the specific infection, and we have already referred to the frequency with which this occurs in young infants. As long as the urethral discharge continues there is the possibility of the accidental transference of infective matter to the conjunctiva, and thus this destructive lesion may be a complication of a rheumatic attack. Of a totally different nature is the catarrhal conjunctivitis and scleritis so frequently seen in the fibrous and polyarticular types of gonorrhœal arthritis. This affection is caused by the gono-toxin, and it is not possible to demonstrate gonococci in the mucous or mucopurulent discharges. Both eyes are affected, but one commences before the other. The conjunctival sac is red and inflamed, and the sclerotic covered by small injected vessels which are especially thick around the sclero-corneal junction. Iritis may follow the scleritis, and subsequently synechiae may form. Scleritis and conjunctivitis usually last from two to three weeks, and then slowly clear up.

Complications and Sequelæ.—Suppurative arthritis is seen from time to time in the course of gonorrhœal rheumatism, and may affect one or more joints. It has been

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stated that this condition may be excited by the gonococcus alone, but if so, such cases are exceptional, the suppuration in general being the result of a mixed infection by the gonococcus, and other pyogenic organisms such as staphylo- and strepto-cocci. In its clinical features and treatment it differs in no way from any other form of suppurative arthritis.

There arises too, sometimes, in the course of gonorrhœal rheumatism a general septicæmia or pyæmia secondary to a simple or mixed infection from the urethra or any secondary gonorrhœal lesion.

The occurrence of acute endocarditis of gonorrhœal origin is now established beyond all doubt. More than a hundred such cases are on record. In the majority of cases the endocarditis has been preceded by an attack of the specific arthritis. Acute ulcerative endocarditis may be due to a pure infection by the gonococcus or to a mixed infection. Thayer and Lazear, who have made a special study of this condition, state that there have been reported five cases in which the chain of evidence may be regarded as complete. In these the gonococcus was found in pure culture in the blood during life, the diagnosis

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of ulcerative endocarditis was confirmed by post-mortem examination, and the gonococcus was obtained in pure culture from the cardiac vegetations, and from other organs after death. In 25 per cent. of the cases of ulcerative endocarditis the valves on the right side of the heart have been attacked. This complication is commoner amongst males. Attempts have been made to show that chronic endocarditis may result from a gonococcal infection. Such a point is obviously difficult of proof, and it seems more likely that the cases reported are really examples of endocarditis of true rheumatic origin arising accidentally in the course of an attack of gonorrhœa.

Pericarditis, myocarditis, and pleurisy are rare accompaniments of gonorrhœal rheumatism.

Urticaria is occasionally seen.

Prognosis.—The prognosis in gonorrhœal rheumatism should be guarded, as it is impossible to say how much ankylosis may follow even the slightest degree of arthritis.

Under the best conditions of hygiene and treatment the symptoms are slow in clearing up. There is not, however, the same tendency to relapse that is seen with acute rheumatism,

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but the patient should be warned that the arthritis is extremely likely to recur with any subsequent attack of urethritis. In weakly, cachectic subjects the condition, especially if of the monarticular type, is liable to pass into that of chronic rheumatoid arthritis (osteo-arthritis) and to be of the most intractable nature.

Ulcerative endocarditis is almost invariably fatal.

Diagnosis.—The conditions most frequently mistaken for gonorrhœal arthritis are subacute rheumatic fever, gout, and pyæmia. If inquiries be made as to the existence of a discharge, and an examination of the genitals and urine made, the risk of error is much diminished. The pyrexia is seldom as high in gonorrhœal arthritis as in rheumatic fever or pyæmia, and there are no rigors. The local signs of redness and œdema, too, are seldom marked, and the number of joints attacked is limited. Contrary to what is the case in acute rheumatism, the arthritis does not shift from joint to joint, and the implication of the soles of the feet, the sternoclavicular, sacro-iliac, and temporo-maxillary joints is strongly suggestive of gonorrhœal infection. Certain general signs, such as

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profuse sweating, a white, furred tongue, and the presence of cardiac complications suggest acute rheumatism, and the diagnosis would be confirmed if the arthritis yield readily to salicylates. Scleritis and conjunctivitis are valuable indications of the gonococcal infection.

As we have already stated, there is no line of demarcation between old-standing monarticular cases and chronic rheumatoid arthritis.

Treatment.—The first and most important point in treatment is the cure of the urethral discharge. Just as in rheumatoid arthritis so in gonorrhœal rheumatism we have absorption from a septic focus exciting and keeping up a condition of arthritis and constitutional disturbance, and until this source of infection is destroyed there can be no hope of cure. We do not purpose here to give in detail the treatment of the urethritis. Our own practice has been to rely locally on injections of protargol ($\frac{1}{2}$, 1, or 2 per cent.) or of argyrol (2 to 5 per cent.), and to administer by the mouth some urinary antiseptic such as Urotropine or Helmitol. In long-standing cases of gleet and stricture a bougie must be passed, or a local cauterisation performed. In women a

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vaginal douche of biniodide of mercury (1 in 10,000) should be given twice daily for a few days, and then a solution of permanganate of potash (1 in 1000) may be used. Local treatment of the cervix uteri and urethra with a solution of nitrate of silver or protargol or mercurol is sometimes necessary.

Whilst the temperature is raised, and the joints and fasciæ are inflamed and painful, the patient must be kept in bed. The bowels should be regulated by the administration of an occasional laxative, and attention paid to the relief of pain by the administration of drugs, and by local applications. Salicylate of soda, aspirin, quinine, and phenacetin may be tried to relieve the pains, but none of these are quite satisfactory, and it is best if the pain be severe to administer opium in the form of pill or draught.

If the arthritis be slight the pains may be relieved by a nightly hot bath, or by fomentations with glycerine of belladonna. In an acute case where the skin is hot, red, and œdematos, and the temperature high, the limb should be placed on a splint, and leeches or an ice-bag applied. If there be any sus-

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picion of pus having formed within the joint, a little fluid should be immediately withdrawn by means of a sterilised exploring syringe. In the monarticular type of the disease we have seen benefit result from aspirating off the fluid in the joint, and then firmly strapping it over Scott's dressing.

The early treatment of the arthritis thus consists in rest, bandaging, splinting, and efforts to relieve the pain. If at the end of ten days or a fortnight the arthritis still persist, and some joints show signs of synovitis, counter-irritation should be reverted to. The joints may be painted each day with linimentum iodi until the skin is sore ; blisters may be applied, or the joints rubbed with the green iodide of mercury ointment. It is at this stage that care must be taken to prevent the supervention of ankylosis. If the joint has been fixed by bandage or splint, it should now be given gentle, passive movements. Any partial fixation of a joint in an unfavourable position should be corrected ; thus the knee and hip should, if flexed, be extended by means of a weight and pulley. When the acute symptoms in the joints have abated great benefit may be derived from massage,

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passive movements, a course of thermal bathing and hot-air baths. Effusion into a joint may be absorbed by the aid of firm strapping, or by the application of a rubber bandage. The hot-air bath is useful in old-standing cases with continued pain and stiffness, and should be employed after any operation for breaking down adhesions. The temperature of the bath should be 300° F., and the treatment given every other day for half-an-hour. On alternate days a constant current of from 15 to 30 milliampères should be passed through the joint by means of electrodes placed on either side of the articulation, and combined with this, kataphoresis with iodide of potassium or sodium salicylate is very useful. This combined treatment by hot-air baths and the constant current is especially efficacious in cases of the monarticular type. It should be continued for at least a month. If in spite of all local and constitutional treatment there remain an indolent, painful swelling of the joint, and if the synovial fluid as tested after exploratory puncture be thick and flaky, it has been suggested that the joint be incised and irrigated. Of such procedure we have no experience, but seeing that

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great improvement often follows simple aspiration of the joint, it seems a promising line of treatment.

Suppuration of a joint would at once necessitate incision and drainage, and the introduction of iodoform emulsion.

Joints that are partially ankylosed by fibrous adhesions and thickening of the capsule should be forcibly moved under an anæsthetic. After the operation an ice-bag is applied to the joint for twelve hours, and at the end of twenty-four hours daily massage, hot-air baths, and passive movements must be begun in order to keep it supple. There is often considerable wasting of muscles around ankylosed joints and also around joints distended with synovial dropsy. Every effort should be made to restore the muscle tone and condition by massage and faradisation, but the process is often an extremely tedious one.

The progress of gonorrhœal rheumatism is little influenced by drugs. Grossis claims good results from intramuscular injections of calomel in the acute stages. Half a grain of calomel is injected every second or third day. Aspirin, sodium salicylate, and quinine with alkalies give relief sometimes in cases

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of painful arthritis, and in the chronic cases iodide of potash with bark, or the syrup of the iodide of iron, or syrups acidi hydriodici (3ss-5i) are of service in reducing the swelling and pain.

In asthenic cases tonics are of the greatest value, and rapid improvement may follow the administration of cod liver oil, iron, and arsenic. Such cases require a liberal diet, and are much benefited by a stay in a warm seaside resort.

When the constitutional symptoms have subsided, any residual arthritis is often improved by a course of combined bathing and massage such as may be obtained at Bath or Aix-les-Bains.

The conjunctivitis and scleritis if troublesome are relieved by shading the eye, and by the application of drops containing one or two grains of sulphate of atropine in an ounce of distilled water.

VI

SCARLATINAL RHEUMATISM

UNDER the title "scarlatinal rheumatism" there have been described three separate and distinct diseases: (1) An arthritis due to the scarlatinal toxin; (2) attacks of acute rheumatic fever occurring in the course of scarlet fever; (3) an arthritis, pyæmic in character, excited by septic organisms. We have not at the present time any exact knowledge of the bacteriology of scarlet fever. Various observers have described it as a protozoan infection, or as due to bacilli, or to streptococci. Class, and Baginsky, and Somerfeld, have each described a diplococcus which they regard as the exciting cause of the disease; and Klein, Curtois, Caddy, Cook, and Gordon favour a streptococcal origin. All observers are agreed, however, that scarlet fever is an acute infective process, and we must regard scarlatinal arthritis as one of the direct consequences of the scarlatinal toxin.

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Scarlatinal arthritis generally supervenes between the fifth and the eighth days of the attack, just as the rash is fading, and the initial fever subsiding. Hospital statistics in this country show that between three and four per cent. of all cases of scarlet fever contract arthritis, but American observers have put the proportion as high as ten to thirteen per cent. Females are more frequently attacked than males, and the greatest incidence is upon young persons between the ages of ten and twenty-five. Arthritis is particularly liable to follow cases in which the initial tonsillitis has been of a severe character.

As we shall see later, scarlet fever is one of the commonest predisposing causes of rheumatic fever, and it is necessary therefore to lay emphasis on the fact that the form of arthritis which we are now describing is entirely distinct from true rheumatic fever which may appear late in the period of desquamation.

Symptoms.—With the onset of arthritis the temperature rises again, but the pyrexia is seldom high, not exceeding 100° F., and falls as the joint symptoms abate. The joints become red, swollen, and painful, and

SCARLATINAL RHEUMATISM

are stiff and tender on movement. The tendency of the inflammation to shift from joint to joint is even more marked than in acute rheumatism. There is slight effusion into the joint, and the condition is that of a serous synovitis. The synovial sheaths of the tendons of the hands and feet may be similarly affected, the extensor tendons of the hands being especially liable. The smaller articulations are those most frequently attacked, the fingers, hands, wrists, elbows, and knees. The symptoms soon subside, and by the end of a week the attack has generally terminated, and shows little tendency to relapse.

Cases in which permanent ankylosis or stiffening of the joints has resulted are generally pyæmic in nature.

Heart.—A systolic apical and basal murmur may often be detected in the course of scarlatinal arthritis, and is probably either due to dilatation of the ventricle, or is hæmic in nature. Such bruits usually disappear before the period of isolation is completed. Occasionally true endocarditis supervenes, but this is rare. Pericarditis is more common, and the frequency of dilatation probably indicates a condition of myocarditis.

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From experience gained as resident at the London Fever Hospital, we consider that cases of scarlet fever which develop arthritis are likely later on to develop nephritis. Two cases under our care which developed arthritis subsequently also showed a papular, itching rash on the trunk, and extensor surfaces of the arms and legs, and in both instances there was subsequent nephritis.

DIAGNOSIS.

Two conditions are liable to be confused with scarlatinal arthritis — the first, pyæmia ; the second, true rheumatic fever.

Pyæmic arthritis occurs in the second and third weeks of the fever in cases presenting some definite septic focus, such as ulceration of the fauces, suppurative adenitis, otitis, &c. The pyrexia is severe ; the illness characterised by rigors, sweating, emaciation, &c. ; by the formation of secondary abscesses, and suppuration in the joints. The joints which most commonly suppurate are the elbow and knee, and this event is more frequently seen in children than in adults. If there be any suspicion of pyæmia, and the local and general symptoms be severe, the joint should

SCARLATINAL RHEUMATISM

be tapped by an exploring needle, and in this way the diagnosis settled at the earliest possible date.

Rheumatic subjects attacked by scarlet fever are particularly liable to a recurrence of *acute* or *subacute rheumatic fever*. The rheumatic fever may occur in the early days of the scarlatina, but more commonly it comes on in the fourth week, or later. We have had many cases of children discharged from the fever hospital brought to the out-patient department of the Bristol General Hospital within one or two weeks of their return home, suffering from subacute rheumatism and cardiac complications.

We have drawn attention to the points that distinguish scarlatinal arthritis from pyæmia, and it is no less important to distinguish the former from acute articular rheumatism.

Scarlatinal arthritis has no seasonal rise or fall of incidence as has rheumatic fever. The constitutional disturbance is slight, the tongue is not furred, nor are there profuse acid sweats. The joint lesions are less severe, the endocardium and pericardium are only exceptionally attacked, and there is a tendency to inflammation of the tendon

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sheaths of the hands and feet which is seldom met with in rheumatic fever. Relapses, too, are uncommon in scarlatinal arthritis. It is noteworthy, however, that the joint lesions in this disease resemble those of acute rheumatism in their method of flitting from one joint to another, and in the fact that they are relieved by salicylates.

It seems probable that the chemical composition of the toxins of the two diseases is closely allied, and it should be remembered that the specific organism of each is probably a strepto- or diplo-strepto-coccus.

That true rheumatic fever frequently follows scarlet fever (more frequently, indeed, than it follows any other disease) there can be no doubt. Its nature is unmistakable, from the fact that it may have as complications, chorea, subcutaneous nodules, endo- and peri-carditis, erythema nodosum, or erythema marginatum.

Treatment.—Scarlatinal arthritis is seldom severe, and the prognosis is good. Pain and fever are checked by the administration of salicylate of soda in doses of 15 or 20 grains every three hours, and with the salicylate there should be combined 20 grains of bicarbonate of soda. Should the arthritis

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not yield to full doses of salicylates pressed until symptoms of salicylism are produced, the pyæmic nature of the attack should be suspected, and an attempt to confirm this diagnosis should be made by withdrawing fluid from one of the joints, and making a microscopical examination.

Warm fomentations relieve the pains in the joints, and these together with glycerine of belladonna may also be applied to the hand or foot in cases of tenosynovitis.

The patient should remain in bed during the attack, and the diet for some days after convalescence should consist entirely of milk and carbohydrates. The urine should be examined systematically during the following weeks, as many of the cases subsequently develop nephritis.

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